



# THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্রাপ্ত কৰ্ত্তৃৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

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No. 302 Dispur, Tuesday, 11th July, 2023, 20th Ashadha, 1945 (S. E.)

GOVERNMENT OF ASSAM  
ORDERS BY THE GOVERNOR  
DEPARTMENT OF HOUSING AND URBAN AFFAIRS

## NOTIFICATION

The 17th June, 2023

eCF No. 306065/2023/161.- In exercise of the powers conferred by the Sub- section (2) and (3) of Section 10 of the Assam Town & Country Planning Act, 1959 (as amended) read with Rule 6 of Assam Town and Country Planning (Publication of Master Plan and Zoning Regulations) Rules 1962, the Governor of Assam is pleased to publish the following notice regarding the publication of the Final Master plan for Tihu.

### Notice for the Publication of Final Master Plan for Tihu.

- It is notified that the Final Master plan for Tihu is prepared by the Directorate of Town & Country Planning, Government of Assam and adopted by the State Government under sub section (2) and (3) of Section 10 of the Assam Town and Country Planning Act, 1959 (as amended) read with Section 6 of the Assam Town and country Planning (Amendment) rule, 1962 for the area described in the schedule below, is hereby published.
- The Final Master plan with all relevant papers and maps may be inspected free of Cost during the office hours at the office of the Director, Town & Country Planning, Assam, Dispur, Guwahati-6, the Deputy Director, Town & Country Planning, District Office- Nalbari, office of the Chairman, Tihu Municipal Board and Tihu Revenue Circle office. Copies of the Final Master Plan is available in the office of the Director, Town & Country Planning, Dispur, Guwahati-6 and Deputy Director, Town & Country Planning, District Office- Nalbari for sale on payment.

**SCHEDULE****A. LOCATION AND AREA**

DISTRICT	:	NALBARI
SUB-DIVISION	:	TIHU
POLICE STATION	:	TIHU
STATE	:	ASSAM
APPROXIMATE MASTER PLAN AREA	:	32.33 Sq.Km
APPROXIMATE MUNICIPAL AREA	:	7.67 Sq.Km

**B. REVENUE AREA INCLUDED IN THE TIHU MASTER PLAN-2041**

1. Tihu Municipal Area
2. 11 Revenue Villages

<b>Mouza</b>	<b>Villages</b>
Tihu	: Barbari, Mathurapur, Nakhara, Nannatari, Niz, Khana, Parmankhowa
Namati	: Bamunbari, Niz Namati, No. 1 Nathkuchi, No.2 Nathkuchi, Ranakuchi.

**C. DESCRIPTION OF BOUNDRIES**

North	: Doloigaon, Thakerkuchi, Bhurkuchi, Murmela
South	: Piplibari, Barmakhibaha, Jal Khana, Bhatuakhana
East	: Na Kuchi (Baksa District), Digheli, Borgaon, Madhapur, Murmela
West	: Barpeta District.

**KAVITHA PADMANABHAN,**  
 Commissioner & Secretary to the Government of Assam,  
 Department of Housing and Urban Affairs,  
 Dispur, Guwahati-6.

## 1. INTRODUCTION TO THE MASTER PLAN AREA

### 1.1 INTRODUCTION

Tihu is a trade and commerce-cum service town located in the north-western part of the Nalbari district. In 1951, with the setting up of the Tihu Town Committee, it was officially elevated to the status of a town. However, even prior to that, Tihu was booming commercially with paddy and mustard being widely traded here with different parts of the state. Over the years, Tihu has grown steadily. Commercial establishments have grown tremendously along the Tihu-Feeder Road.

#### 1.1.1 *Location:*

Tihu Master Plan Area is located between 26°27' north to 26°32' north latitude and 91°14' east to 91°18' east longitude. The area has a plain topography with an altitude of about 47 m/154.20 ft. It is located to the north of the mighty Brahmaputra River.

#### 1.1.2 *Regional Settings:*

Tihu is well connected to the outer world through rail and road. It is 100 kilometres (62 mi) from Dispur, the capital of Assam and 25 km from Nalbari, the District Headquarters. The East West Corridor (NH 27) of India is to the north of the town. The rail station is situated towards the south of the Tihu town.

#### 1.1.3 *Brief History of the Town:*

Tihu is an important urban centre of Nalbari district. A culturally rich town, to know about its unique history, we shall have to know more about the 'Tihu' river which flows through the town. The Tihu river is said to have its source at Bhogpur reserve in Baksa district. It flows under the name of Bhalukbhoga and Shingra before finally attaining the name 'Tihu'.



Dr Banikanta Kakati opined about the origin of the name 'Tihu' in his doctorate thesis 'Assamese: Its Formation and Development'. He listed a few possibilities regarding the etymology. He said that the Austric synonyms of the word 'water' are Hu, Hung, Du, Diu, Tiu, etc. Rivers were commonly named after

**Figure 1-1: Tihu River**

suffixing or prefixing the synonyms of water to another word. Accordingly, we have rivers in Assam named as- Ti-hu, Ti-ok, Di-hang, Ti-pam, etc. Also, the Bodos who used to settle along rivers in the earlier days followed a similar scheme in naming rivers. 'Di' means water in Bodo. It is believed that they prefixed 'Di' to 'Hung', the latter possibly indicating the ancient name of the river, forming a new word 'Dihu'. With time, 'Dihu' eventually got transformed to 'Tihu'.

Later in 1910, when a railway station was established in Tihu, the Eastern Bengal State Railway also honoured it with the name 'Tihu', acknowledging the river. The river and the railway station are widely considered as the two major factors contributing to the naming of the town as 'Tihu'.

## 1.2 PHYSICAL ENVIRONMENTAL CONDITION

### 1.2.1 *Climate:*

Tihu Master Plan area experiences humid sub-tropical climate with heavy rainfall and hot summer. The summers extend from May to August with an average temperature of 29°C. The monsoon starts from April and lasts up to August. The relative humidity varies from 74% to 85% during the monsoon period. Average annual rainfall is around 1900 mm with maximum rainfall during august. Winters are cold and dry and extends from October to February with an average temperature of 16 °C.

### 1.2.2 *Physiography:*

Tihu Master Plan area with the rest of the Nalbari district lies in the northern part of the mighty Brahmaputra river. Accordingly the district can be divided into- (i) Northern alluvial region and (ii) the southern flood plains of the river. Tihu being located in the north-western part of the Nalbari district lies in the northern flat alluvial plains of the Brahmaputra.

### 1.2.3 *Soil Condition:*

Alluvial soil of recent age occurs along the Tihu Master Plain area. The soil here can be characterised as clay loamy.

## 1.3 MASTER PLAN: DEFINITION & FORMULATION

Most of the urban settlements, especially smaller urban settlements, are characterized by haphazard and unplanned growth, non-conforming land uses, mushrooming unauthorized colonies, and land conversion from agriculture to urban resulting in environmental degradation and poor quality of life.

Master Plan/Development Plan is the major tool for urban land management, providing detailed land-use allocation for the sustainable development of city/town. Most master/development plans are made for 20-25 year periods, in phases of five years for periodic review and revision. A master plan is prepared either for improvement of an old city or for a new town to be developed on a virgin soil.

The purpose of the master plan is to set down as clearly and practically as possible the best and most appropriate future development of the town. For physical planning to be successful, it must develop a consensus on sound principles while balancing the visionary with the realistic. Formulation of master plans start with base map preparation, existing land use surveys and collection of socio-economic data necessary for reviewing the existing situation and proposing the future land use plan. With the advances in remote sensing and geographic information system, the plan making process can be expedited with integration of both spatial and attribute data, which enables detailed assessment of spatial growth of towns/cities, land use status, physical infrastructure facilities, etc. in anticipation of the projected population growth.

## 1.4 NEED OF THE MASTER PLAN

A master plan is a blueprint for the future. It will help-

- To control the development of various industries in a systematic way.
- To define public, semiprivate, and private spaces and public amenities.

- To discourage the growth of town in an unplanned and unscientific way.
- To give a perspective picture of a fully developed town.
- To limit to a certain extent the unprecedented flow of rural population to the urban area.
- To offset the evils which have come up due to over-crowding of population such as acute shortage of houses, traffic congestion, inadequate open spaces and insufficiency in public amenities; etc.

### **1.5 PROJECT OBJECTIVE & ITS VISION**

The broad objective of this project is to prepare a Master Plan Report for Tihu Town. Report is the final output of the research.

Vision being a cherished dream, to achieve this vision it is necessary to break it into a number of goals and subsequently to objectives.

- Identifying existing gaps in physical and social infrastructure & to bridge those gaps
- By proper policy planning and strict adherence of the land use zoning and building byelaws.
- By submerging the planning with combining funds from the state as well as the centrally sponsored schemes
- Ensuring systematic, balanced & integrated development.
- Prioritizing Environmental Sustainability
- Facilitating Economic Development
- Enhancing Heritage, Culture & Public Life
- Improving Housing and Social Infrastructure
- Developing Resilient Physical infrastructure.

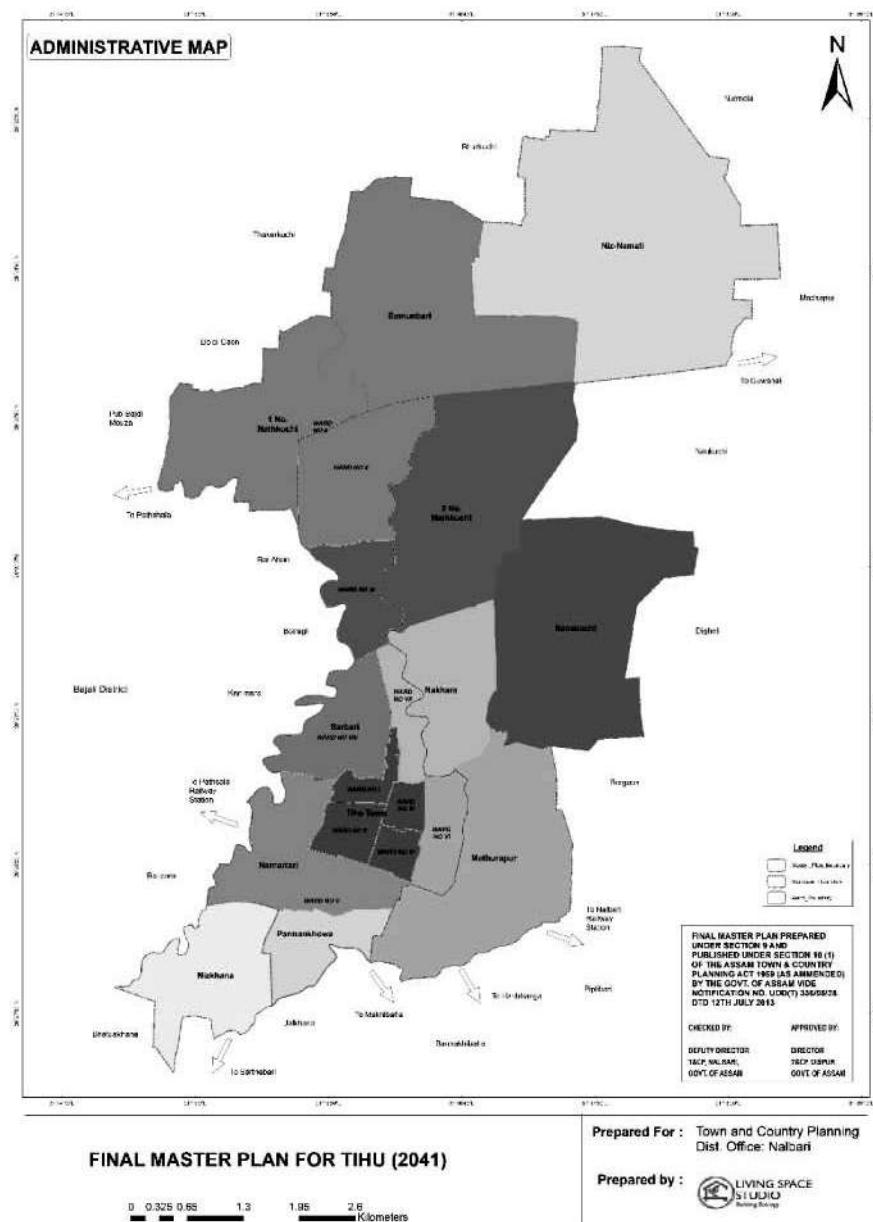
### **1.6 SCOPE OF WORK**

- To identify the gaps/ incongruities between the actual land use and existing Master Plan proposals.
- To assess current situations, prospects, priorities and proposals for development.
- To identify the systematic and methodological deficiencies in implementation and preparation of Master Plan.

## **2. PROFILE OF THE MASTER PLAN AREA**

## 2.1 INTRODUCTION

The Tihu Master Plan Area is located in Nalbari district covering an area of 32.33 sq. km. The Tihu Municipal Board area had 4 wards and covered an area of 1.219 sq. km. However, in 2020 the Municipal Board Area was extended to 10 wards, covering an area of 7.676 sq. km. The population of the extended town is 14078.



**Figure 2-1: Political Map of Tihu Master Plan Area**

### **2.1.1 Demographic Profile:**

#### **2.1.1.1 Population:**

As per the Census data of 2011, the total population of Tihu Master Plan area is 27,807 and it has witnessed a decadal growth rate of 7.64%. Tentatively, the population of the extended Tihu town comprising of 10 wards was 14087 in 2011 and 12008 in 2001, indicating a decadal population growth rate of 17.31%. The census data of the newly formed wards are not available. If we consider the earlier 4 wards of the town, in 2011 it saw a decadal population growth of 6.88%. The steady population growth witnessed in this region has been primarily due to migration and fall in the death rate due to better and affordable access to health services.

#### **2.1.1.2 Population Growth:**

Tihu Master Plan Area has been subjected to steady increase in population over the decades. The following tables show the decadal growth rate of population in Tihu Municipal Area and Tihu Master Plan Area from 1971 to 2011.

**Table 2-1: Growth of Population in Tihu (1971 - 2011)**

Year	Tihu Municipal Area (earlier 4 wards)		Tihu Master Plan Area Excluding the Municipal area		Tihu Master Plan Area	
	Population	%variation	Population	%variation	Population	%variation
1971	2244	-	14032	-	16276	-
1991	4292	91.26%	19317	37.66%	23609	45.05%
2001	4303	0.26%	21531	11.46%	25834	9.42%
2011	4599	6.88%	23208	7.79%	27807	7.64%

*Source: Compiled from Census of India*

*\*Census was not held in 1981 in Assam*

**Table 2-2: Growth of Population in Tihu extended town (10 wards)**

Year	Tihu Municipal Area	
	Population	%variation
1991	10265	-
2001	12008	16.98%
2011	14078	17.24%

*\*\* Tentative figures*

As evident from the table, the Tihu Master Plan Area excluding the municipal area has undergone a declining decadal growth rate from 2001 to 2011. This has been due to a fall in the birth rate promoted by the awareness of the benefits of small family size disseminated by the education and the health sector. On the other hand, Tihu Municipal Area has witnessed a significant decadal population growth rate. This region is an urban centre and has attracted migrants in search of better economic prospects from the peripheral villages.

#### **2.1.1.3 Population Trend:**

The table below shows the ward-wise population of Tihu town including the newly created wards. Ward 5 has the highest population i.e., 2946 while Ward 10 has the lowest population i.e., 388.

**Table 2-3: Ward-wise population of the extended Tihu Town (2011)**

Ward No	Name of Ward	Population
1	Ward 1	1072
2	Ward 2	1195
3	Ward 3	1136
4	Ward 4	1172
5	Ward 5	2946
6	Ward 6	1913
7	Ward 7	1954
8	Ward 8	1622
9	Ward 9	680
10	Ward 10	388
<b>Total</b>		<b>14078</b>

*Source: Tihu Municipal Board*

As per the Census 2011, the population of the villages included in the Tihu Master Plan-2041 is as follows:

**Table 2-4: Tihu Master Plan Area (Excluding Tihu Municipality Area), 2011**

Sl_No	Village	No. of Households	No. of Population
1	Bamunbari	344	1653
2	Barbari	350	1595
3	Mathurapur	666	3022
4	Nakhara	552	2431
5	Nannatari	434	1854
6	Niz Khana	217	1004
7	Niz Namati	1008	4784
8	No. 1 Nathkuchi	656	2986
9	No. 2 Nathkuchi	358	1651
10	Parmankhowa	117	559
11	Ranakuchi	342	1669
<b>Total</b>		<b>5044</b>	<b>23208</b>

*Source: District Census Handbook, Census of India, 2011*

#### **2.1.1.4 Population and Area Distribution:**

The following table shows the population density in person per hectare:

**Table 2-5: Population and Area Distribution, Tihu Municipality Area- 2011**

<b>Category</b>	<b>Master Plan Area</b>	<b>Municipality Area (earlier 4 wards)</b>	<b>Municipality Area (10 wards)</b>
Area (HA)	3233	122	767
Total Population	27807	4599	14078
Number of Wards	-	4	10
Density (ppha)	8.60	37.7	18.35

*Source: Compiled from census of India, 2011 and Tihu Municipal Board*

#### **2.1.1.5 Sex Ratio:**

The table below depicts the sex-ratio from 2001 to 2011 for Tihu Municipal Area and Tihu Master Plan Area excluding the Municipal Area:

**Table 2-3: Sex Ratio of Tihu Town & Master Plan Area**

<b>Year</b>	<b>SEX RATIO</b>		
	<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan Area Excluding the Municipal Area</b>	<b>Tihu Master Plan Area</b>
2001	894	958	947
2011	968	973	970

*Source: District Census Handbook, Census of India, 2001, 2011*

Tihu Municipal Area has witnessed a tremendous improvement in the sex ratio over the decade, from 894 females per 1000 males in 2001 to 968 females per 1000 males in 2011. Tihu Master Plan area excluding the Municipal Area has also witnessed a decent improvement in its sex ratio. In fact, the sex ratio of these areas is higher than the district figure of 949 females per 1000 males and the state figure of 958 females per 1000 males as per Census data, 2011. However, a skewed distribution of sex still prevails due to social preference for males. In the face of this challenge, the role of Accredited Social Health activists (ASHA) and anganwadi workers needs to be enlarged. Awareness should be spread regarding proper nutritional support, timely immunization and health check-ups for all infants and children, irrespective of the gender.

#### **2.1.1.6 Child Population:**

As per 2011 Census, out of the total population of the Tihu Master Plan Area (27807), 2493 are children belonging to the age group of 0-6. This accounts for 8.97% of the total population. In Tihu Municipal Area, the population of children of belonging to this age group is 382, accounting for 8.31% of the total population. Also here, the Child Sex Ratio is 1234 females per 1000 males which presents a favourable picture.

**Table 2-4: Child Population of Tihu, 2011**

<b>Age Group</b>		<b>Male Population</b>	<b>Female Population</b>	<b>Total</b>
<b>0-6</b>	<b>Master Plan Area (Excluding Municipality)</b>	1059	1052	2111
	<b>Municipality (4 wards)</b>	171	211	382
<b>Total Population</b>		<b>1230</b>	<b>1263</b>	<b>2493</b>

*Source: District Census Handbook, Census of India 2011*

**2.1.1.6 Age-Sex Composition:**

**Table 2-5: Age-Sex Composition of Tihu, 2011**

<b>Age Group</b>	<b>Tihu Municipal Area (4 wards)</b>			<b>Tihu Master Plan area Excluding Municipal Area</b>		
	<b>Male Population</b>	<b>Female Population</b>	<b>Total Population</b>	<b>Male Population</b>	<b>Female Population</b>	<b>Total Population</b>
0-6	171	211	382	1059	1052	2111
7-60+	2166	2051	4217	10717	10380	21097
<b>Total</b>	<b>2337</b>	<b>2262</b>	<b>4599</b>	<b>11776</b>	<b>11432</b>	<b>23208</b>

*Source: District Census Handbook, Census of India 2011*

**2.1.1.7 Literacy Rate:**

The following table shows the figures of literacy rate in Tihu as per the Census data, 2011.

**Table 2-6: Literacy rate of Tihu, 2011**

	<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan area excluding the municipal area</b>	<b>Total Tihu Master Plan Area</b>
Male Literacy	2058 (95.01%)	10090 (94.15%)	12148 (94.29%)
Female Literacy	1856 (90.49%)	8731 (84.11%)	10587 (85.17%)
<b>Total Literacy</b>	<b>3914 (92.81%)</b>	<b>18821 (89.21%)</b>	<b>22735 (89.82%)</b>

*Source: District Census Handbook, Census of India 2011*

The total literacy rate of all the three areas in focus is higher than the district literacy rate of 79.89% and the state literacy rate of 72.19% as indicated by the Census, 2011. The same can be said about the male and female literacy rate. The district male and female literacy rate stands at 85.58% and 73.85% respectively, while the state male and female literacy rate stands at 77.85% and 66.27% respectively. However, the area of concern is the wide disparity between male and female literacy rate prevailing in these areas. To counter the problem and retain girls in higher levels of education, the state government has been giving out free bicycles to girl students after class 8 and 2 wheelers to college going girls. Also, the central government has been targeting to bring about positive behavioural changes through campaigns like ‘Beti Padhao, Beti Bachao’.

**2.1.1.8 SC-ST Population:**

The SC-ST population of Tihu from 2001 to 2011 is depicted as follows:

**Table 2-7: SC-ST Population, Tihu, 2011**

<b>Year</b>	<b>Tihu Municipal Area (4 wards)</b>					<b>Tihu Master Plan Area excluding the Municipal Area</b>				
	<b>Total Pop.</b>	<b>SC pop.</b>	<b>% of SC pop.</b>	<b>ST pop.</b>	<b>% of ST</b>	<b>Total Population</b>	<b>SC pop.</b>	<b>% of SC</b>	<b>ST pop.</b>	<b>% of ST Pop.</b>
2001	4303	863	20.06%	60	1.39%	21531	6340	29.45%	884	4.11%
2011	4599	1088	23.66%	71	1.54%	23208	7127	30.70%	1220	5.26%

*Source: District Census Handbook, Census of India 2011*

The proportion of SC and ST population has increased marginally from 2001 to 2011 in both Tihu Municipal Area and Tihu Master Plan Area excluding the Municipal Area. Also, the proportion of SC population is more than ST population in both the areas.

## 2.2 MIGRATION

Migration is the key force driving urbanisation. Urbanisation is the shift of population from rural areas to urban areas. It is the process by which towns and cities grow as more people come to live in it. It provides both opportunities and challenges to the urban centres. Migrants offer their skills at reasonable cost driving the growth of these centres. Challenges mostly appear in the area of their accommodation. The unskilled workers working at minimal wage find it difficult to land in a decent accommodation. Another challenge which the migrant workers especially the vendors create, is the haphazard and unorganized manner in which they conduct their vocation, often by the roadside, obstructing the free flow of traffic. They also do not practise sound waste disposal methods and litter here and there, creating an unsanitary environment.

In Tihu, migration is prominent during the non-farming and non-harvesting seasons. The rural folks seek employment in sectors like hotels and restaurants. To ensure a holistic growth and development of Tihu, it is very important to thoughtfully manage the migrants. As of now, we do not have data regarding the migrant population of Tihu Town.

## 2.3 URBAN HOUSING

Traditionally, the people have been living in individual houses made up of bamboo and wood due to easy availability of the raw materials. However, due to increase in population and space constraint there has been unrestricted growth of RCC buildings and multi-storeyed structures. Many of these buildings are not earthquake resistant.

### 2.3.1 *Household Size*

The average household size of the Tihu Master Plan area is 4.56 as per 2011 census.

**Table 2-8: Population and Household Size of Tihu Master Plan Area – 1991, 2001& 2011**

Town/ State/ Country	1991			2001			2011		
	Total Population	Number of Households	Household Size	Total Population	Number of Households	Household Size	Total Population	Number of Households	Household Size
Tihu Master Plan Area	23,609	3,928	6.01	25,834	4,826	5.35	27,807	6,085	4.56
Assam Urban Population	24,87,795	-	-	34,39,240	-	-	43,98,542	-	-

Town/ State/ Country	1991			2001			2011		
	Total Population	Number of Households	Household Size	Total Population	Number of Households	Household Size	Total Population	Number of Households	Household Size
India Urban Population	21,32,83,817	3,99,37,922	5.3	2,81,61,19,689	5,58,32,570	5.12	37,71,05,760	7,88,65,937	4.78

*Source: Compiled from Housing and Household Tables, Census of India, 1991 & 2001,\* Provisional Population Totals 2011*

## 2.4 POPULATION PROJECTION

Population is the most important factor which is directly related to the various needs of the area. The prime objective of any Master Plan is to assess the present situation and project the future population for plan period, and accordingly calculate the requirements of both physical and social infrastructure in order to cater to the needs of such population. Therefore, population projection is the basic requirement for the projection of other needs of the area. From all these projections the developmental plan of an area should be prepared which can fulfil the different needs of the people living therein.

To arrive at a conclusive projection figure, three methods of population projections have been used for the city as well as the whole MP Area. The methods used for projecting population are:

- i. Arithmetic Progression Method.
- ii. Geometric Progression Method.
- iii. Incremental Increase Method.

Based on the past population growth trends— low, medium and high – population estimate for Tihu Master Plan Area for the year 2041 have been worked out assuming different growth rate for Municipal Area and Master Plan Area.

The following tables show the projected population for 2041. In case of Tihu Town, projection has been done using the census data, 2011 of the initial 4 wards as well as the extended town comprising of 10 wards. Tihu town is projected to have a population of 21678 by the plan period 2041. Geometric Progression method projected the highest population i.e., 23473 followed by Incremental Increase method (21761) and Arithmetic Progression Method (19799) –

**Table 2-9: Population estimates for Tihu Town (earlier 4 wards)- 2041**

<b>Method</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Arithmetic Progression method	4753	4906	5060
Geometric Progression method	4763	4933	5109
Incremental Increase method	5038	5761	6770
<b>Average</b>	<b>4851</b>	<b>5200</b>	<b>5646</b>

*Source: Calculations based on AM, GM & Incr. Incr Method*

**Table 2-10: Population estimates of the extended Tihu town (10 wards)-2041**

<b>Method</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Arithmetic Progression method	15985	17892	19799
Geometric Progression method	16694	19795	23473
Incremental Increase method	16312	18873	21761
<b>Average</b>	<b>16330</b>	<b>18853</b>	<b>21678</b>

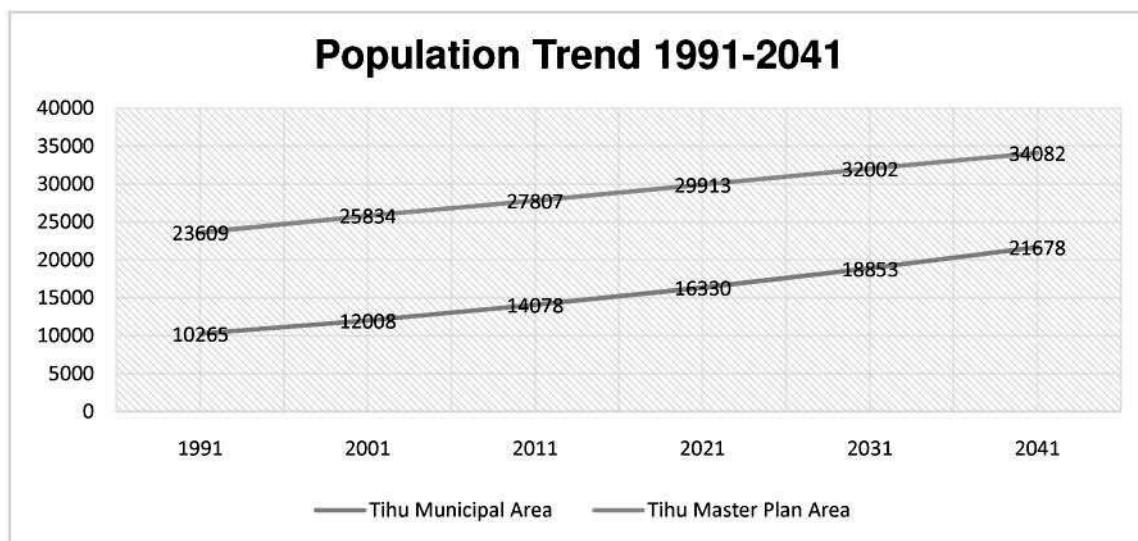
*Source: Calculations based on AM, GM & Incr. Incr Method*

In case of Tihu Master Plan Area, the table below shows the comparison of population projections done by different methods, revealing that Geometric Increase method shows the highest population forecast with the estimation of 35547 by year 2041, followed by Arithmetic Progression method at 34104 and by Incremental Increase method at 32594.

**Table 2-11: Population estimates for Tihu Master Plan Area- 2041**

<b>Method</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Arithmetic Progression method	29906	32005	34104
Geometric Progression method	30179	32753	35547
Incremental Increase method	29654	31249	32594
<b>Average</b>	<b>29913</b>	<b>32002</b>	<b>34082</b>

*Source: Calculations based on AM, GM & Incr. Incr Method*



The average of all the methods applied for population projection for horizon year 2041 has more relevance to the Master Plan area and shall provide realistic estimates with greater accuracy. Hence, the population estimates derived by taking average of all the three methods has been considered for the Tihu Master Plan Area. By following this process the population of the Tihu Master Plan Area shall be 29913, 32002 and 34082 for the year 2021, 2031 and 2041 respectively.

### **3. ECONOMIC BASE AND EMPLOYMENT**

#### **3.1 INTRODUCTION**

Tihu town is a major centre of trade and commerce for the peripheral villages. It has a few administrative offices and branches of major banks catering to the needs of the Master Plan area. Also, since it serves as a centre of education, it has professionals engaged in the education sector. It has the only TDC /Master degree offering college and B.Ed/D El Ed College in the Master Plan area besides a decent number of government and private schools. Consequently, the occupation here is service-based. Trade is also booming here and shops serving more or less every sort of demand is found in Tihu. In the recent years, there has also been a growth of the unorganized sector. Street vendors, construction workers, drivers and domestic helpers either migrants or based in Tihu have started dominating the occupation pattern due to improvement in the standard of living of the general population.

With regards to the Tihu Master Plan Area, there are large tracts of agricultural lands and people engage in the primary sector dealing in activities like farming and livestock rearing. The secondary sector also has a visible presence in the form of rice mills, wheat mills, food processing units like jam and pickles. Recently, the North-East Mega Food Park has been set up in No. 1 Nathkuchi further boosting this sector and providing employment to the youth.

#### **3.2 WORK PARTICIPATION RATE AND NON-WORKERS**

As per the Census of India, the population can be divided into main workers, marginal workers and non-workers. They can be defined as:

- Main Worker: One who has worked in any economically productive work for at least 183 days/6 months in a year.
- Marginal Worker: One who has engaged in economically productive work for less than 183 days/6 months in a year.
- The ones who have not participated in any economically productive activity constitutes the 'Non-Workers'.

These main workers and marginal workers can again be classified as Cultivators, Agricultural Labourers, Household Industry Workers, and Other Workers. They can be defined in the following way:

1. Cultivator: One who is engaged in the cultivation of land owned or held from Government or held from private persons or institution for payment in money, kind or share, is a cultivator. A person who gives out his/her land for cultivation to another person(s) or institution for money, kind or share of crop, and is not involved in the supervision or direction of the cultivation of land, does not constitute a cultivator. Similarly, a person who is working on someone else's land for cash or kind or combination of both is not a cultivator.
2. Agricultural Labourer: An agricultural Labourer is one who works on someone else's land for wages or kind or share. He/she has no right of lease or contract on land on which he/she works.
3. Household Industry: It may be defined as an industry conducted by the head of the household and/or by the members of the household at home or within the village in rural areas, and only within the precincts of the house where the households live in urban areas. The larger proportion of workers in the household industry consists of members of the household.

Household industry relates to production, processing, servicing, repairing or making and selling of goods.

4. Other Workers: All the workers other than cultivators or agricultural labourers or household industry workers are Other Workers. They include all government servants, municipal employees, teachers, factory workers, plantation workers, those involved in trade, commerce, banking, construction, political or social works, etc.

### **3.2.1 Working Population**

The table below shows the work participation rate in Tihu from 1991 to 2011:

**Table 3-1: Working Population of Tihu Master Plan Area**

Year	Tihu Municipal Area (4 wards) (A)			Tihu Master Plan Area excluding the Municipal Area (B)			Total Master Plan Area (A)+(B)		
	Total Population	Total Workers	Work Participation Rate	Total Population	Total Workers	Work Participation Rate	Total Population	Total Workers	Work Participation Rate
1991	4292	1441	33.54%	19317	4347	22.50%	23609	5788	24.51%
2001	4303	1357	31.54%	21531	6486	30.12%	25834	7843	30.36%
2011	4599	1951	42.42%	23208	8720	37.57%	27807	10671	38.38%

Source: District Statistical Handbook, Census of India, 1991, 2001, 2011

There had been steady improvement in work participation rate in Tihu. In 2011 the work-participation rate is 38.38% compared to 30.36% in 2001. Newer jobs has been created due to improvement of the overall economy and the consequent emergence of more and newer demands for goods and services.

### **3.2.2 Non-Working Population**

The table below shows the Non-working participation rate from 1991 to 2011:

**Table 3-2: Non-Working Population of Tihu Master Plan Area**

Year	Tihu Municipal Area ( 4 wards) (A)			Tihu Master Plan Area excluding the Municipal Area (B)			Total Master Plan Area (A)+(B)		
	Total Population	Total Non-Workers	Non-Worker Participation Rate	Total Population	Total Non-Workers	Non-Worker Participation Rate	Total Population	Total Non-Workers	Non-Worker Participation Rate
1991	4292	2851	66.42%	19317	14970	77.50%	23609	17821	75.49%
2001	4303	2946	68.46%	21531	15045	69.88%	25834	17991	69.64%
2011	4599	2648	57.58%	23208	14488	62.43%	27807	17136	61.62%

Source: District Statistical Handbook, Census of India, 1991, 2001, 2011

### 3.3 OCCUPATION PATTERN:

The size of total workers in Tihu Master Plan area is 10671 of which 18.28% belongs to the Tihu Municipal Area and 81.72% belongs to the Master Plan Area excluding the municipal area. The table below shows the occupation pattern in the Tihu Master Plan Area.

**Table 3-3: Occupational Structure of Tihu Master Plan Area**

Sl. No.	Category	Municipality (4 wards)	Percentage (%)	Male	Female	Master Plan Area (Excluding Municipality)	Percentage (%)	Male	Female
<b>1</b>	<b>Main Workers</b>	<b>1387</b>	-	<b>1121</b>	<b>266</b>	<b>6190</b>	-	<b>5285</b>	<b>905</b>
i	Main Cultivators	8	0.58%	2	4	1126	18.19 %	1058	68
ii	Main Agriculture Labourers	3	0.22%	3	0	343	5.54%	299	44
iii	Main Household Main Industry workers	24	1.73%	12	12	480	7.75%	289	191
iv	Other workers	1354	97.62%	1106	248	4241	68.52 %	3635	606
<b>2</b>	<b>Marginal Workers</b>	<b>564</b>	-	<b>246</b>	<b>318</b>	<b>2530</b>	-	<b>1240</b>	<b>1290</b>
i	Marginal Cultivators	1	0.18%	1	0	107	4.23%	76	31
ii	Marginal Agriculture Labourers	7	1.24%	5	2	473	18.70 %	182	291
ii	Marginal Household Industry workers	15	2.66%	12	3	507	20.04 %	57	450
iv	Marginal Other workers	541	95.92%	231	31	1443	57.03 %	925	518
<b>Total Workers (Main + Marginal)</b>		<b>1951</b>	-	<b>1367</b>	<b>548</b>	<b>8720</b>	-	<b>6525</b>	<b>2195</b>

Source: District Statistical Handbook, Census of India, 2011

It is evident from the table that in the Tihu Master Plan Area excluding municipality, a sizable proportion of the workers are either cultivators or agricultural labourers. In order to improve the condition of this lot, the agricultural infrastructure needs to augmented, ranging from modern and smart methods of irrigation to accessibility to high standard seeds. In the Tihu Municipal area, most of the workers are in the service sector or in trade and commerce.

### 3.4 INFORMAL SECTOR:

Tihu town has been witnessing steady urbanisation which has inflated the size of informal sector practising various vocation. They usually locate themselves strategically near work centres, commercial areas outside the boundaries of schools, colleges and hospitals, transport nodes and near large housing clusters. Often times, they create problems like obstruction of traffic. They also cause overcrowding and unsanitary conditions in public spaces and streets.

The size of informal sector is only bound to expand with the growth of Tihu Town. The sector must be integrated with city planning and development process in order to rationalise the town's growth and development. A supportive environment should be created to enable the vendors to carry out their vocation. The area where they carry out their trade should have suitable public convenience arrangements and must be kept clean.

#### 3.4.1 *Vending Zone*

Keeping in mind that street vendors are indispensable part of any city, three vending zones have been identified in Tihu town. These zones have been demarcated in the Zoning Map for reference and are as follows:

##### 1. Tihu Chowk, near Basanti Mandir, Ward No. 10



##### 2. Near Raaskhola, Ward No. 3



##### 3. Fish Market- Tihu Dainik Bazar, Ward No. 1



The spaces demarcated as vending zones are not far from the main road which will ensure public convenience in accessing them while also ensuring minimum hindrance to the flow of traffic. Awareness should be disseminated among the vendors so that they look after the public property and maintain cleanliness and public hygiene.

### **3.5 MAJOR WORK AREAS: TRADE AND COMMERCE**

Trade and commerce is gradually flourishing in Tihu, especially along the main thoroughfares. Commercial establishments are densely packed especially along the Tihu-Feeder Road in Tihu town. The loading and unloading of goods in these establishments take place along the road, creating an obstruction in the flow of traffic.

- **Wholesale trade:** As per the information provided by Tihu Municipal Board, there are 20 wholesale commercial establishments in Tihu as on February, 2022.
- **Retail trade:** There are 980 retail commercial establishments scattered all over Tihu town as on February, 2022 and they cater to a variety of demands of the people.
- **Vendors and Bazars:** There are 230 vendors in Tihu town and 3 Daily Bazars and 1 weekly bazar.

### **3.6 INDUSTRIAL DEVELOPMENT**

As a region develops, we see a steady decline in the proportion of people engaged on agriculture and an increasing reliance on secondary and tertiary sector for gainful employment. A similar trend is noticeable in Tihu Master Plan area. While agriculture still plays an important role here, there is an expansion of secondary and tertiary economic activities. As per the information collected from District Industries & Commerce Centre, Nalbari, there is a high potential for development of micro food processing units in the area due to high agricultural productivity. The government has developed the North East Mega Food Park in this area besides Industrial Estate and IIDC in Nathkuchi. There is a huge capacity cold storage installed in the Mega Food Park which can be availed by the food processing units situated in the periphery of the industrial park. However, there is a lack of awareness among the local entrepreneurs and a lack of marketing linkages for the micro food processing units. To overcome this, initiatives are being taken under the APART scheme to facilitate market linkages. There are also other schemes to promote industrial development in the area such as PMEGP, PMFME, NEIDS 2017, IIPA 2019, and Bamboo Mission.

Rice mills, wheat mills, food processing industries, paint factory, steel fabrication are the existing industries in the Tihu Master Plan area. Under UDYAM, 73 micro industries and 7 small industries has been registered as on February 2022. Under Entrepreneurs Memorandum Part-2, 57 industrial units have been registered in the MP area. About 757 employees are working in the registered industries.

### **3.7 AGRICULTURAL DEVELOPMENT**

Tihu Master Plan area is predominantly an agrarian economy. The major crops sown here are winter paddy, rape and mustard seed, rabi pulses, potatoes, rabi and kharif vegetables, etc. The scale of commercialisation of agriculture is moderate here. Most of the farmers in the Tihu Master Plan area are small and marginal which places a financial constraint in the way of mechanising farming and increasing the productivity of the workers and consequently the yield of the land. Lack of irrigation facilities and fragmented land holdings also diminishes agricultural productivity, making them unviable in terms of agricultural produce.

There are numerous schemes in place to promote agricultural development in the region. Some of them are NFSM-RICE, NFSM- Pulse, ATMA, BGREI, PMFBY, PMKISAN, etc. There is immense scope for agricultural development in the region. Allied agricultural activities such as horticulture, bee-keeping, mushroom cultivation, and vermi-composting can be explored on a larger scale.

## **4. HOUSING AND SHELTER**

### **4.1 HOUSING SCENARIO**

Housing may be defined as a unit of accommodation to protect its occupants from the forces of nature. It is an important component of human resource development, and is a prerequisite for healthy living. Defined broadly, housing encapsulates adequate space, lighting, ventilation, security and amenities like water supply, proper drainage, and sanitation, etc., to lead a dignified life. Houses provide physical and economic security and is considered a status symbol across the world. The United Nation's Universal Declaration of Human Rights, 1948, recognizes the need of housing along with food, clothing, medical care, etc. as a right to a standard living required for health and well-being of everyone.

In India, the Census office defines a house as a building or part of a building having separate main entrance from the road or common courtyard or staircase, etc. used or recognised as a separate unit. It may be occupied or vacant. It may be used for residential or non-residential purpose, or both.

The housing scenario in Tihu Master Plan Area has witnessed a change in the recent years due to government schemes and spread of loan related financial literacy, but there still persists a gap between the demand and supply of dwelling units. The issue is somewhat pronounced in Tihu Municipal Area, which has seen influx of job seekers especially menial workers in search of better economic prospects. This has necessitated the development of shelters and low cost houses to prevent sprouting of slums and squatters without basic amenities. The problem regarding housing in Tihu Municipal Area is also of unsatisfactory physical and social conditions due to overcrowding and congestion factor. In the rural areas, the problem is of unsound housing quality. Some of the housing problems being faced in rural areas are:

- Rural houses lack basic amenities like sanitation.
- The houses do not provide adequate protection to occupants against wind, rain and cold.
- The houses are infested with insects and rodents, which are major health hazards.

While changes are happening in the housing scenario of Tihu, the process has been slow primarily due to high construction costs which most people are unable to afford. As a result, Tihu is lagging behind in terms of adequate housing backed by proper facilities and basic amenities to lead a dignified life.

#### **4.1.1 TYPES OF HOUSES**

In Tihu, basically 3 types of houses are being built-

- Kutch House: A house having mud floor, bamboo wall plastered with mud and thatch roof.
- Assam Type (Semi pucca): A house having brick wall, cement concrete flooring, CGI/AC sheet roofing.
- Pucca House: A house having cement concrete flooring, brick wall and RCC slab roofing.

Most of the houses in Tihu are self-built. There is no presence of private builders in the scene. To provide assistance for house construction and renovation, especially to the Economically Weaker Section (EWS), Low Income Group (LIG), Middle Income Group (MIG), minorities, socially backward sections of society and physically challenged, the government has put in place affordable housing schemes. These have brought about a perceptible change in the housing scenario.

The houses constructed in Tihu are either self-occupied or rented. Rented accommodation is particularly noticeable in Tihu Municipal Area due to the presence of workers and students from peripheral villages. In Tihu Master Plan Area excluding the Municipal Area, an insignificant proportion of houses are rented. The Table below shows the status of owned and rented houses in Tihu as per Nalbari District Census Handbook, 2011:

**Table 4-1:Housing Typology of Tihu Master Plan Area**

Ownership Status	Tihu Municipal Area (4 wards)	Tihu Master Plan Area excluding the municipal Area	Total Tihu Master Plan Area
Owned	654	4862	<b>5516</b>
Rented	331	149	<b>480</b>
Any others	56	33	<b>89</b>

*Source: District Census Handbook, Census of India 2011*

331 households live in rented accommodation in Tihu Municipal Area, which is 31.8% of the total households. This implies that the area is witnessing urbanization. In Tihu Master Plan Area excluding the Municipal Area, 4862 households which is 96.40% of the total households are owned and only 149 is rented.

## 4.2 HOUSING SUPPLY MECHANISM

Majority of the houses in Tihu are self-built. However, there are government schemes in place to provide affordable housing to economically and socially backward sections of the society.

### 4.2.1 *Schemes currently in operation in Tihu*

1. **Integrated Housing & Slum Development Programme (IHSDP):** This scheme was launched in December 2005. The objectives are:
  - To provide an integrated approach to ameliorate the conditions of slum dwellers who do not possess adequate shelter and basic facilities.
  - To strive for slum less cities with healthy living and good environment.
  - To enhance public and private investments in housing and infrastructure development in urban areas.
2. **Prime Minister Awas Yojana (Urban) {PMAY (U)}:** This scheme launched in 2015, aims to provide housing for all in the urban areas by 2022. The mission seeks to address the housing requirement of urban poor including slum dwellers through the following programme verticals:
  - Slum rehabilitation of slum dwellers with participation of private developers using land as a resource.
  - Affordable housing through credit linked subsidy.
  - Affordable housing in partnership with public and private sector.
  - Subsidy for beneficiary led individual house construction/enhancement.
3. **Individuals Household Latrine (IHHL) under Swachh Bharat Mission (SBM):** IHHL under SBM aims to eliminate open defecation in the country. Here applicants can approach the local authorities in their area to get central assistance for construction of toilets. They can also complete the process online through an official portal of the central government. Conversion of old toilets can also be applied for.

4. **National Urban Livelihood Mission (NULM):** Launched in 2013, NULM aims to provide permanent shelter equipped with essential services to the urban homeless in a phased manner under the scheme of Shelter for Urban Homeless (SUH). The objectives of the Shelter for Urban Homeless (SUH) component of NULM scheme are to:
- Ensure availability and access of the urban homeless population to permanent shelters including the basic infrastructure facilities like water supply, sanitation, safety and security.
  - Cater to the needs of especially vulnerable segments of the urban homeless like the dependent children, aged, disabled, mentally ill and recovering gravely ill, by creating special sections within homeless shelters and provisioning special service linkages for them.
  - Provide access to various entitlements, viz. social security pensions, PDS, ICDS, identity, financial inclusion, education, affordable housing etc. for homeless populations.
  - Formulate structures and framework of engagement for development, management and monitoring of shelters and ensuring basic services to homeless persons, by state and civil society organisations including homeless collectives.

5. **Apun Ghar Home Loan:** The Government of Assam has initiated a housing scheme known as Apun Ghar Home Loan scheme to provide home loan for State Government employee on subsidized interest rates. Assam Government has signed a Memorandum of Understanding (MOU) with State Bank of India for the same. Under the home loan scheme, the eligible beneficiaries who are permanent residents and employee of State Government can avail a maximum loan amount of Rs.15 Lakhs without collateral security from the concerned bank. The Assam Government will provide 3.5% subsidy of interest to the Government employee under this scheme. Once the application is approved, the interest of home loan will be 5% for women and 5.05% for men.

#### **4.3 TIHU HOUSING STATUS**

##### **4.3.1 Housing Condition:**

Housing condition indicates the physical state of the house or dwelling unit. It can be classified into good, livable, and dilapidated. They can be defined in the following manner-

- Those houses which do not require any repairs and are in good condition may be considered as 'Good'.
- Those houses which require minor repairs may be considered as 'Livable'.
- Those houses which are showing signs of decay or those breaking down and require major repairs or those houses decayed or ruined and are far from being in conditions that can be restored or repaired may be considered as 'Dilapidated'.

The distribution of households based on different housing condition in Tihu can be understood from the following table:

**Table 4-2: Overall Housing condition in Tihu**

Condition	Tihu Municipal Area (4 wards)	Tihu Master plan Area excluding the Municipal Area	Total Master Plan Area
Good	675	2018	2693
Livable	250	2438	2688
Dilapidated	116	588	704
<b>Total</b>	<b>1041</b>	<b>5044</b>	<b>6085</b>

Source: District Census Handbook, Census of India 2011

According to the table above, 116 households which is 11.2% of the households in Tihu Municipal Area and 588 households which is 11.7% of the households in Tihu Master Plan Area excluding the Municipal Area live in dilapidated housing as per the Census data, 2011. However, it should be noted that progress has been made due to different affordable housing schemes and improvement in economic condition of the people.

**Table 4-3: HHs Condition as Residence of Tihu MP Area**

Condition of Census Households as Residence	Tihu Municipal Area (4 wards)	Tihu Master Plan Area (excluding MB area)	Total Master Plan Area
Good	626	2011	2637
Livable	232	2423	2655
Dilapidated	108	586	694

*Source: District Census Handbook, Census of India 2011*

**Table 4-4: HHs Condition as Residence-cum-other Use of Tihu MP Area**

Condition of Census Households as Residence	Tihu Municipal Area (4 wards)	Tihu Master Plan Area (excluding MB area)	Total Master Plan Area
Good	49	7	56
Livable	18	16	34
Dilapidated	8	2	10

*Source: District Census Handbook, Census of India 2011*

#### **4.3.2 Housing Structure:**

The Housing Structure can be classified into the following categories:

- **Permanent:** Houses with wall and roof made of permanent materials. Wall can be made of G.I., Stone packed with Mortar, Stone not packed with Mortar, Metal, Asbestos sheets, Burnt bricks, Stone or Concrete. Roof can be made of Hand-made tiles, Machine made tiles, Slate, G.I., Metal, Asbestos sheets, Brick, Stone or Concrete.
- **Semi-Permanent:** Either wall or roof is made of permanent material, and the other is made of temporary material.
- **Temporary:** Houses with wall and roof made of temporary material. Wall can be made of Grass, Thatch, Bamboo etc., Plastic, Polythene, Mud, Unburnt brick or Wood. Roof can be made of Grass, Thatch, Bamboo, Wood, Mud, Plastic or Polythene.
- **Serviceable temporary:** Wall is made of Mud, Un-burnt brick or Wood.
- **Non-serviceable:** Wall is made of Grass, Thatch, Bamboo etc., Plastic or Polythene.

The following table shows the distribution of households based on the structure:

**Table 4-5: Housing Structure of Tihu MP Area**

Structure of the Households		Tihu Municipal Area (4 wards)	Tihu Master plan Area excluding the Municipal Area	Total Master Plan Area
Permanent		766	2396	3163
Semi-Permanent		243	2385	2628
Total Temporary	Serviceable	0	5	5
	Non-Serviceable	32	252	284
Unclassifiable		0	5	5
<b>Total</b>		<b>1042</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

A sizeable portion of the population in Tihu lives in Temporary, Serviceable, and Non-Serviceable houses. These houses are easily prone to damage due to rainfall or natural calamities like earthquakes and floods.

#### **4.3.3 Type of Material:**

The following table depicts data on the type of predominant material of roof across households in Tihu

**Table 4-6: Housing roofing Material of Tihu MP Area**

Materials	Tihu Municipal Area (4 wards)	Tihu Master Plan Area (excluding MB area)	Total Master Plan Area
Grass/Thatch/Bamboo/Wood/Mud etc.	10	103	113
Plastic/ Polythene	22	158	180
Handmade Tiles	0	4	4
Machine made Tiles	0	0	0
Burnt Brick	0	5	5
Stone/ Slate	0	7	7
G.I./Metal/Asbestos sheets	891	4754	5645
Concrete	118	11	129
Any other material	0	2	2
<b>Total</b>	<b>1041</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

Majority of the people in Tihu Total master plan area used G.I./Metal/Asbestos sheets in their roofing constituting 92.8%.

#### **4.3.4 Availability of Kitchen:**

Meals may be prepared by the household under the following settings:

- In a separate room inside the house.
- Inside the house but in an unenclosed space. No separate kitchen is available.
- In a separate room outside the house.
- Outside the house in an open space.

The following table depicts the availability of kitchen across households in Tihu:

**Table 4-7: Availability of Kitchen in Tihu MP Area**

<b>Kitchen Facility</b>		<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan Area excluding the Municipal Area</b>	<b>Total Tihu Master Plan Area</b>
Cooking inside house	Has Kitchen	873	4553	5426
	Does not have kitchen	96	346	442
Cooking outside house	Has kitchen	25	79	104
	Does not have kitchen	42	58	100
No Cooking		5	8	13
<b>Total</b>		<b>1041</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

9.2% of the households in Tihu Municipal Area and 7.3% households in Total Tihu Master Plan Area cooks inside the house but do not have separate kitchen. Here meals are cooked without proper ventilation which can cause nausea and headaches among other health effects.

#### **4.3.5 Availability of Latrine:**

Availability of proper latrine with piped sewer system or septic tank is a must for households to lead a dignified life. Lack of access to latrine results in a plethora of problems. Open defecation and outdated latrines like Pit Latrine and Service Latrine creates an unhealthy environment by attracting flies and contaminating land and water sources. It is known to spread fatal diarrhoeal diseases especially among children. It also creates discomfort and raises security issues among adolescent girls and women. The following table depicts the distribution of the availability of latrine facilities across households in Tihu:

**Table 4-8: Availability of Latrine in Tihu MP Area**

<b>Latrine Facility</b>		<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan Area excluding the Municipal Area</b>	<b>Total Tihu Master Plan Area</b>
Flush/pour flush latrine	Piped sewer system	237	353	590
	Septic tank	588	865	1453
	Other system	28	678	706
Pit latrine	With slab/ventilated improved pit	67	722	789
	Without slab/open slab	27	860	887
Night soil disposed into open drain		1	11	12
Service latrine	Night soil removed by human	0	13	13
	Night soil serviced by animal	0	101	101
Households not having latrine		93	1441	1534
<b>Total</b>		<b>1041</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

The table paints a gloomy picture of the sanitation condition in Tihu. However, it should be noted that the access to latrines have improved immensely in the recent times. Individual Household Latrines (IHHLs) have been constructed under the Swachh Bharat Mission launched on 2<sup>nd</sup> October, 2014. Accordingly, the entire Nalbari district was declared Open-Defecation Free on August, 2017.

#### **4.3.6 Availability of Bathroom:**

The following table shows the availability of bathroom across households in Tihu:

**Table 4-9: Availability of Bathroom in Tihu MP Area**

<b>Bathroom Facility</b>		<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan Area excluding the Municipal Area</b>	<b>Total Tihu Master Plan Area</b>
Yes	Bathroom	792	2216	3008
	Enclosure without roof	87	916	1003
No Bathroom		162	1912	2074
<b>Total</b>		<b>1041</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

From the table, it is clear that 2074 households or 34.1% of the households under Tihu Master Plan Area do not have access to bathrooms. 1003 households or 16.5% have only enclosures without roof. This is a major barrier in the way of living a dignified life, and reflects how the master plan area is lagging behind.

#### **4.3.7 Availability of Drainage Facility:**

Drainage system is used for disposal of waste water and other liquid waste from the house. It can be either closed or open. If a house has water outlet to carry away the waste water to an underground network, it is termed as closed drainage. If the water outlet is connected to open drains, it is called open drainage. If open drainage is used to carry sanitary wastes, it can be very unhygienic and pose health risks. Proper drainage system is crucial to prevent water logging and property damage.

The following table shows the availability of drainage facility in Tihu:

**Table 4-10: Availability of drainage in Tihu MP Area**

<b>Waste water outlet connected to-</b>	<b>Tihu Municipal Area (4 wards)</b>	<b>Tihu Master Plan Area excluding the Municipal Area</b>	<b>Total Tihu Master Plan Area</b>
Closed Drainage	86	75	161
Open Drainage	595	587	1182
No Drainage	360	4382	4742
<b>Total</b>	<b>1041</b>	<b>5044</b>	<b>6085</b>

*Source: District Census Handbook, Census of India 2011*

4382 households or 86.9% of the households in Tihu Master Plan Area excluding the Municipal Area do not have any drainage facility. Closed drainage system accounts for only 8.3% of the availability of drainage in Tihu Municipal Area, and 2.6% in Tihu Master Plan Area. This paints a sad picture of the overall sanitation condition in Tihu.

#### 4.4 HOUSING SITUATION

##### 4.4.1 Household Family size

The following table shows the no. of person per house in Tihu MP area:

**Table 4-11: Family household size in Tihu MP Area**

Year	Number of Residential Houses	Total Population	Number of Persons per Houses
2011	6085 (1041+5044)	27807 (4599+23208)	4.56

*Source: District Census Handbook, Census of India 2011*

##### 4.4.2 Housing Shortage

Housing shortage in Tihu Master Plan Area considering census 2011 housing data has been taken into consideration.

**Table 4-12: Factors taken into considerations for Housing Shortage**

Sl. No	Factors	Description	Remarks
1	Obsolescence factor	As decided by ninth plan working group committee of GoI, dwelling units aged 80 years or more are treated as obsolete. Percentage of households living in the dwelling units having age 40-80 years and in bad condition and percentage of households living in all structures aged 80+ years, irrespective of condition of structure, taken together as obsolescence factor and considered as housing requirement.	<b>704 HHs</b> <i>(refer in Table 4-2)</i>
2	Temporary housing	All temporary houses should be considered as housing requirements as per recommendations. According to census data both Temporary houses and unclassifiable houses should be taken into consideration to arrive at the total number of temporary housing	<b>294 HHs</b> <i>(5+289) of total no. of HHs in Master plan area lived in temporary structure. (refer in Table 4-5)</i>
3	Houses with predominantly katcha or semi pucca roof material	Houses with Katcha and Semi Pucca roof in the cities are considered to be contributing towards the actual housing stock	<b>302 HHs</b> <i>(refer in Table 4-6)</i>

*Source: Assam Urban Affordable Housing & Habitat Policy  
Analysis by DD Dist. office, Nalbari*

Therefore the total housing shortage for Tihu MP Area is calculated as follows:

**Table 4-13: Computation of Current Housing Shortage in Tihu**

<b>Parameter</b>	<b>Number of Housing Units</b>
1. Obsolescence factor	704
2. Temporary housing	294
3. Houses with predominantly katcha or semi pucca roof material	302
<b>Total Housing Shortage</b>	<b>1300</b>
<b>Total HHs in Tihu MP area (as per 2011 census)</b>	<b>6085</b>
<b>Housing Shortage in percent (Housing Shortage / No. of Urban HHs)</b>	<b>21.36%</b>

*Source: Calculated Values*

Based on the above **table 4-13**, in 2011 the housing shortage works out to be around 1300 in Tihu Master Plan Area. However, it should be noted that these figures are tentative and there may be overlap between different housing shortage parameters.

#### **4.4.3 Housing Need assessment**

The numbers of dwelling units available in comparison to the total population reveals that there is congestion both in the town as well as in surrounding villages within the Master Plan Area. So there will be a demand of additional houses in the MP area in future.

The projected housing requirement in Tihu Master Plan area in 2041 is as under:

**Table 4-14: Future Housing Shortage in Tihu MP Area in a decade**

<b>Year</b>	<b>Projected Population</b>	<b>Incremental Population in a decade</b>	<b>No. of persons per household</b>	<b>No. of HHs needed</b>	<b>No. of HHs Available</b>	<b>Housing Demand</b>	<b>Shortage in 2011</b>	<b>Total Deficit</b>
2021	29913	2106	4.56	6560	6085 (Census 2011)	475	1300 (Table: 4-13)	1775
2031	32002	2089	4.56	7018	-	933	-	2708
2041	34082	2080	4.56	7474	-	1389	-	4097

*Source: Calculated Values*

It is seen from the Table that approximately 4097 new housing units needs to be distributed in the existing and new developments in the next 20 years. Also, it is enunciated to provide 20% allocation of

dwelling units in the flatted group housing projects for Economically Weaker Section (EWS) and Low Income Group (LIG) preferably at cross-subsidized rates.

#### **4.5 IDENTIFICATION OF SUITABLE GOVERNMENT/ULB LAND FOR HOUSING**

The government land parcels in and around the Tihu town can be used for developing affordable housing. Most of these lands are underutilized and prone to encroachment. Rental housing complexes can be developed to accommodate migrant workers and prevent the sprouting of slums and squatters. Private investments in government lands can be explored. Different models of PPP can be adopted to make use of these underutilized lands and move closer to the target of achieving Housing For All by 2022. Private real estate developers should be invited to partner with the government to build affordable residential projects. This will ensure efficiency and faster delivery of houses.

## **5. TRANSPORTATION**

### **5.1 INTRODUCTION**

Transportation facilitates commerce and communication. It provides access to places of employment, recreational centres and medical facilities. It is also the engine of economic growth. It is an integral component of supply chain management and therefore, a sound transportation infrastructure is crucial for maintaining price stability.

Road and Rail network plays a vital role in the urban planning, and traffic and transportation are considered as a function of land use planning. Transport network are considered as the lifeline of the city and if any bottleneck or obstruction arises, it will pose severe threat to the day-to-day life of the people. A good road and rail network is a symbol of sound development of a city. A bad transportation infrastructure on the other hand makes vehicles susceptible to wear and tear, increases fuel consumption of automobiles, and increases the likelihood of accidents.

The study of transportation helps in understanding the existing situation, potentials, weaknesses, etc. and consequently aids to draft out strategies and projects for future development.

### **5.2 REGISTERED VEHICLES IN TIHU MASTER PLAN AREA**

As per the data provided by the District Transport Office, Nalbari there are following number of registered vehicles in the Tihu Master Plan Area as on 08<sup>th</sup> December, 2021:

**Table 5-1: Registered Vehicles in Tihu Master Plan Area**

Type of vehicle	Number
Two-wheeler	13900
E-Rickshaw	200
Passenger Car	500
Commercial Vehicle	1200
Bus	8
Truck	85
<b>Total</b>	<b>15,893</b>

Source: District Transport office, Nalbari

### **5.3 ROAD NETWORKS OF TIHU**

Tihu is well connected by roads. The National Highway 27 passes through the northern part of the Master Plan Area. It is just 3 km from the heart of Tihu town and connects it to the district headquarters, Nalbari and State Capital, Dispur. The NH 27 also connects it to Barpeta district in the west. Besides this, Tihu town is well connected to Barpeta via. the Sarthebari-Tihu Road.

There are also two major railway crossing at the southern part the town, i.e. at New-Chowk and Khaliaguri Haribhangha road.

#### **5.3.1 Major Roads in Tihu:**

The following table shows the major roads in Tihu town along with their length and average width:

**Table 5-2: Roads with their length and width, Tihu Town**

Roads	Length (meters)	Width (meters)
Tihu Feeder Road	8500	15
Tihu College Approach Road	650	6
Tihu Girls High School Approach Road	250	6
Tihu Gandhi Bhawan to Railway Road	750	6
Tihu IB to Tihu River via. Tihu College Road	800	5
Tihu Hari Mandir Road	300	6
Khalihaguri to Railway Road	800	6
Tihu Feeder Road to Bhadrakuchi Road	650	6
Tihu GM Mill to Khalihaguri Road	700	6

**5.3.2 Traffic Volume at Major Locations:**

Traffic volume surveys was conducted by Town & Country Planning, Nalbari along the major transport routes and at the major intersection. This was carried out in order to generate an idea about the traffic volume along the major routes and at the major intersections, the peak hour timing, the peak hour traffic and also the peak hour traffic composition.

**Table 5-3: Traffic Volume Survey 2022 (Feb), Tihu Town,  
Morning (8 A.M to 12 Noon) - Incoming**

Location	M-Cycle/Scooter	Car	Bicycle	E-Rickshaw	Rickshaw	Auto/Tempo	Mini-Bus/Traveller/Winger	Truck	Bus	Thela	Tractor	Mini-Truck, Ape, Pick-Up	Total
Tihu Feeder Road (Tihu Chowk)	534	133	190	26	5	118	12	19	1	4	4	25	1071
Sarthebari Tihu Road (New Chowk)	770	87	426	62	0	32	5	11	4	8	5	39	1449
Tihu Makhibaha Road (New Chowk)	671	98	179	49	1	32	4	6	2	6	5	33	1086
<b>Total</b>	<b>1975</b>	<b>318</b>	<b>795</b>	<b>137</b>	<b>6</b>	<b>182</b>	<b>21</b>	<b>36</b>	<b>7</b>	<b>18</b>	<b>14</b>	<b>97</b>	<b>3606</b>

Source: Survey Conducted By Town & Country Planning Assam, Dist Office: Nalbari

In the morning time, it has been observed that a highest no. of 1449 vehicles entered Tihu town from the Sarthebari-Tihu Road, with motor-cycles/scooters being the dominant mode of transportation, i.e., 770.

Also here, it has been observed that between 8 a.m. to 10 a.m., a lot of bicycles pass, mostly rode by students going to their respective education institutes.

**Table 5-4: Traffic Volume Survey 2022 (Feb), Tihu Town,  
Morning (8 A.M to 12 Noon) – Outgoing**

Location	M-Cycle/Scooter	Car	Bicycle	E-Rickshaw	Rickshaw	Auto/Tempo	Mini-Bus/Traveller/Winger	Truck	Bus	Thela	Tractor	Mini-Truck,Ape, Pick-Up	Total
Tihu Feeder Road (Tihu Chowk)	562	190	162	22	1	113	25	17	4	7	2	28	1133
Sarthebari Tihu Road (New Chowk)	436	70	209	50	0	24	2	8	1	3	2	34	839
Tihu Makhibaha Road (New Chowk)	329	55	94	39	0	32	3	7	0	3	8	19	589
<b>Total</b>	<b>1327</b>	<b>315</b>	<b>465</b>	<b>111</b>	<b>1</b>	<b>169</b>	<b>30</b>	<b>32</b>	<b>5</b>	<b>13</b>	<b>12</b>	<b>81</b>	<b>2561</b>

*Source: Survey Conducted By Town & Country Planning Assam, Dist Office: Nalbari*

During the morning hours, maximum vehicles amounting to 1133 left Tihu Town via. the Feeder Road. Altogether, a total of 2561 vehicles exited Tihu town.

**Table 5-5: Traffic Volume Survey 2022 (Feb), Tihu Town,  
Afternoon (12 Noon to 5 P.M) - Incoming**

Location	M-Cycle/Scooter	Car	Bicycle	E-Rickshaw	Rickshaw	Auto/Tempo	Mini-Bus/ Traveller/ Winger	Truck	Bus	Thela	Tractor	Mini-Truck, Ape, Pick-Up	Total
Tihu Feeder Road (Tihu Chowk)	685	277	174	33	12	130	37	36	1	4	0	66	<b>1455</b>
Sarthebari Tihu Road (New Chowk)	831	124	369	72	1	55	5	48	0	6	10	34	<b>1555</b>
Tihu Makhiba Road (New Chowk)	794	119	154	56	0	33	10	13	1	4	9	60	<b>1253</b>
<b>Total</b>	<b>2310</b>	<b>520</b>	<b>697</b>	<b>161</b>	<b>13</b>	<b>218</b>	<b>52</b>	<b>97</b>	<b>2</b>	<b>14</b>	<b>19</b>	<b>160</b>	<b>4263</b>

*Source: Survey Conducted By Town & Country Planning Assam, Dist Office: Nalbari*

In the afternoon, Sarthebari-Tihu road saw the highest incoming traffic to Tihu town at 1555, followed by Tihu-Feeder Road at 1455.

**Table 5-6: Traffic Volume Survey 2022 (Feb), Tihu Town,  
Afternoon (12 Noon to 5 P.M) - Outgoing**

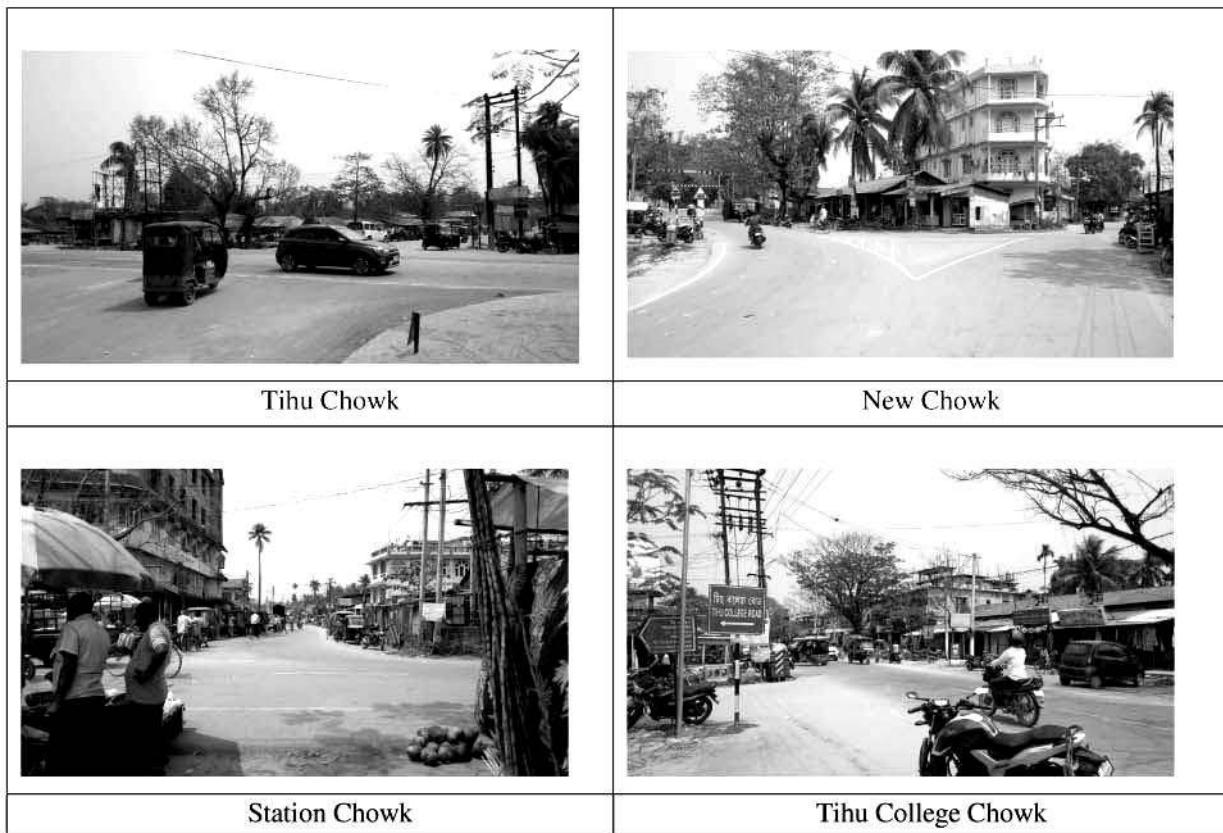
Location	M-Cycle/Scooter	Car	Bicycle	E-Rickshaw	Rickshaw	Auto/Tempo	Traveller/Winger	Truck	Bus	Thela	Tractor	Mini-Truck, Ape, Pick-Up	Total
Tihu Feeder Road (Tihu Chowk)	682	438	134	33	2	133	20	57	4	2	0	76	<b>1581</b>
Sarthebari Tihu Road (New Chowk)	703	154	241	76	1	37	3	32	0	4	7	47	<b>1305</b>
Tihu Makhibaha Road (New Chowk)	657	136	116	61	0	30	9	17	0	4	10	54	<b>1094</b>
<b>Total</b>	<b>2042</b>	<b>728</b>	<b>491</b>	<b>170</b>	<b>3</b>	<b>200</b>	<b>32</b>	<b>106</b>	<b>4</b>	<b>10</b>	<b>17</b>	<b>177</b>	<b>3980</b>

*Source: Survey Conducted By Town & Country Planning Assam, Dist Office: Nalbari*

In the afternoon, 1581 vehicles left Tihu town by the Tihu-Feeder road. Motor-cycles/scooter is the dominant vehicle exiting the town in all the three roads, the highest being 703 at Sarthebari-Tihu Road.

#### 5.4 AREAS OF MAJOR CONGESTION

It has been observed from the traffic survey that areas of New Chowk, Tihu Station Chowk, Tihu College Chowk, face traffic congestion especially during peak hours. In New Chowk, it has been observed that frequent closure of the rail gate obstructs the flow of traffic and causes jams.



## 5.5 TRANSPORT INFRASTRUCTURE

Within the Tihu town, there is 1 bus stop near the Police Station. The buses plying on NH 27 stop at Tihu Chowk. The infrastructure around these bus stops is not adequately developed. They stop by the road side creating traffic bottlenecks during peak hours.

The designated auto-stands in Tihu Town are near the Police Station and near UCO Bank. Tihu Chowk also has an auto-stand.

Since these bus-stands and auto-stands cater to a large segment of the population daily, they should be equipped with standard waiting rooms, toilet facilities, and dustbins to make the environment around them accessible, comfortable and sanitary.

## 5.6 FREIGHT ZONES AND LOGISTICS

As Tihu is favourably located in proximity to the state capital, a provision of efficient goods transportation facility is important to promote trade and commerce, and in turn economy of the town. Since the town has an agro based economy with horticulture produces, there is lot of goods movement between the towns and surrounding villages/region, which can also be anticipated in the future.

The presence of significant food processing units and proposal for extension of the freight complex and industrial area will generate goods traffic not only seasonally but throughout the year. To provide them a permanent and formal parking space, a Truck Terminal has been proposed near the industrial zone.

The truck terminus will have major components like packaging, office complex, restaurant, accommodation, parking and other ancillary facilities. It has to be developed in phases to avoid the

creation of surplus infrastructure. Truck Terminal will be designed for the idle parking of the trucks and carriers/containers.

#### **5.6.1 *Movement of Goods Modes***

The movement of goods modes on the road network needs to be rationalized. Goods modes can be grouped into three types as under:

- **Small sized vehicles like pickups:**

Small size vehicles like ‘Pick ups’ perform an essential distribution function. In space occupancy and manoeuvrability they are similar to cars. Their movement on all road sections, at all times of day may be permitted. As part of traffic management plans, separate parking areas for ‘Pick ups’ may be identified.

- **Medium sized vehicles like LCVs**

Medium size vehicles like LCVs are important to move goods to and from industries, warehouses and other major activities. They affect overall level of service of traffic.

- **Large size vehicles like 2/3 Axle Trucks, Truck Trailer & MAVs**

Large sized goods vehicles consume high proportion of road capacity, impede traffic flows, causes accidents, adversely affect environment and consume large extent of land for parking. As these vehicles are bringing in/taking out traffic from/to other parts of the country, these vehicles need to be received at the urban periphery and facilitated in terms of planned terminals. Major truck terminals and/or idle parking are proposed.

### **5.7 FOOTPATHS AND BICYCLE TRACKS**

As no standard footpaths and bicycle tracks are visible in the Town, people are often seen walking on the road causing the movement of the traffic to slow down. Also road-side encroachment by the informal Sector on the footpaths create obstruction in the way of facilitation of smooth movement of Traffic. This Master Plan proposes footpaths which are sustainably integrated as fundamental part of urban life.

#### **5.7.1 *Pedestrian Facilities***

Walking is a predominant mode of movement in the town. The transport system plan promotes and facilitates walking. The main strategies and measures proposed as part of the plan are as under:

- Provision of side-walks on primary arterials, sub-arterials and collectors on both sides of the road and on at least one side on local roads;
- Cross pedestrian facilities to be provided as per the warrants recommended by Indian Roads Congress;
- Side-walks on all the major roads;
- Improvement measures in terms of pedestrian controlled facilities at intersections, grade separators and widening of side-walks in the Central Area and along major corridors.
- Pedestrians should remain at ground level with comfortable and safe access and minimum detours from the most direct path, unless there is no other alternative.
- In-depth study will be made to declare many roads in market and office places as pedestrian roads.
- Local pedestrian and cyclist routes on the street will be preferred to rear and side yard pathways.

- A continuous unobstructed footpath on each side of all streets with ROW wider than 12m. Minimum width of footpath should be 1.8 m (with clear height 2.4 m.) in addition to space for trees/greenery/vending spaces and surface utilities. Width of footpath shall be determined based on pedestrian volume and have to be wider than 1.8 m wherever required.
- Natural Surveillance or “eyes on the street” should be enabled on all roads by removing setbacks and boundary walls and building to the edge of the street, wherever permitted as per norms. This would allow people from inside to look out on to the pavement, thus discouraging harassment of women on footpaths, bus-stops and public spaces.

## 5.8 PARKING: ON-STREET AND OFF-STREET

There is no on- street, off-street provision of parking in the Town. The Town has high inadequacy of organized parking space for the motorized vehicle. The cars are parked in the main road of the town creating congestion. The roads are already overburdened with traffic and encroachment.

### 5.8.1 *Parking Policy:*

Every vehicle trip ends in a demand for parking of the vehicle at its trip end. The parking of vehicles needs extensive and exclusive land area. Otherwise parking would spill over to other use areas like road carriageway and footpaths, open spaces. In turn they would affect safety and environmental quality.

The escalating demand and varied needs of parking in Tihu can only be met and organized in the framework of a comprehensive Parking Policy. Parking policy needs to move from ‘non-restrictive’ to ‘restrictive’ policy. ‘Restrictive’ policy would include shifting from banning of parking to restricted provision, regulation and pricing of parking spaces. However, the recommended parking policy for the town should have the following salient features as per the Urban National Transport Policy (NUTP)-2006:

- Preferential allocation of parking space(s) for public transport vehicles and non-motorized modes of transport;
- Levy of graded scale of parking fee representing truly the value of the land occupied;
- Development of efficient accessibility to parking lots;
- Encourage to go in for electronic metering for better realization of parking fee;
- Development of underground parking in green areas (considering the social acceptance of the people);
- Encouraging people to use public transport to reach city centre(s);
- Development of parking lots on PPP format for reducing burden on public funds
- Restricted and high- priced public parking to discourage unnecessary private transport;
- Very low- priced public parking for bicycles and e-bikes to encourage bicycles and e-bikes.
- Schemes will be made for central municipal area to provide 1 Equivalent Car Space (ECS) per 100 sq.m. of covered area, with mandatory 5% of the parking area earmarked for bicycles, and wheelchairs.;
- At least 10% of the parking area shall be equipped with charging points for electric vehicles.
- Prohibit street parking or enforce high parking fines for private vehicles on public streets and Spaces (other than parking areas), in order to encourage use of other modes.

The Master Plan asserts that a comprehensive parking policy for the area shall be prepared separately taking into account all aspects including existing and potential parking demand, institutional measures and implementation mechanism.

## **5.9 STREET LIGHTING AND PROPOSED IMPROVEMENT PLAN**

Adequate street lighting is crucial for the safety of motorists and pedestrians. There are about 261 functional LED lights in Tihu town. The coverage of street lights is inadequate especially in the interior lanes. There is also a need for installations of new street lights in the newly notified wards. Another problem is the frequent power outages affecting the lighting. It is proposed that technologies like standalone solar LED street lighting be explored. Scientific planning should go into determining the installation of street lights as lighting requirements of different areas vary. It is proposed that Tihu have an energy efficient street lighting, and continuity of street lighting for carriageway and pavements for safety purpose. The distance between poles should not be more than 30 meters. Key locations like the stretch of road from Tihu Chowk to Tihu Railway station should be installed with adequate streetlights, considering it is heavily used by vehicular traffic and pedestrians.

## **5.10 SIGNAGE AVAILABILITY AND REQUIREMENTS**

### **5.10.1 *Lane Markings and Signage***

Very few Lane Markings and Signage has been observed throughout the Town. Traffic signals, signs and pavement markings are used for traffic control so that-

- All on-street parking spaces are clearly defined by lane markings.
- Adequate and appropriate signage are installed at all places on the street network to identify ‘parking’ and ‘no parking’ areas.
- Off-street parking places are clearly identified by signs and distinguishing marks.

## **5.11 DEMARCATON OF ZERO POINT**

Permanent Bench Marks for Tihu have been collected from PWRD Nalbari. They are as follows:

<b>BM</b>	<b>Northing</b>	<b>Easting</b>	<b>Longitude</b>	<b>Latitude</b>	<b>Elevation</b>
BM 1	2929407.532	327396.553	91°16'6.410802"E	26°28'28.562044"N	50.549
BM 2	2929395.86	327393.967	91°16'6.323121"E	26.28'28.181683"N	50.494

A ZERO POINT will accordingly be demarcated in the campus of PWD Inspection Bungalow in Tihu to level control construction of roads, drains and plinth height of houses.

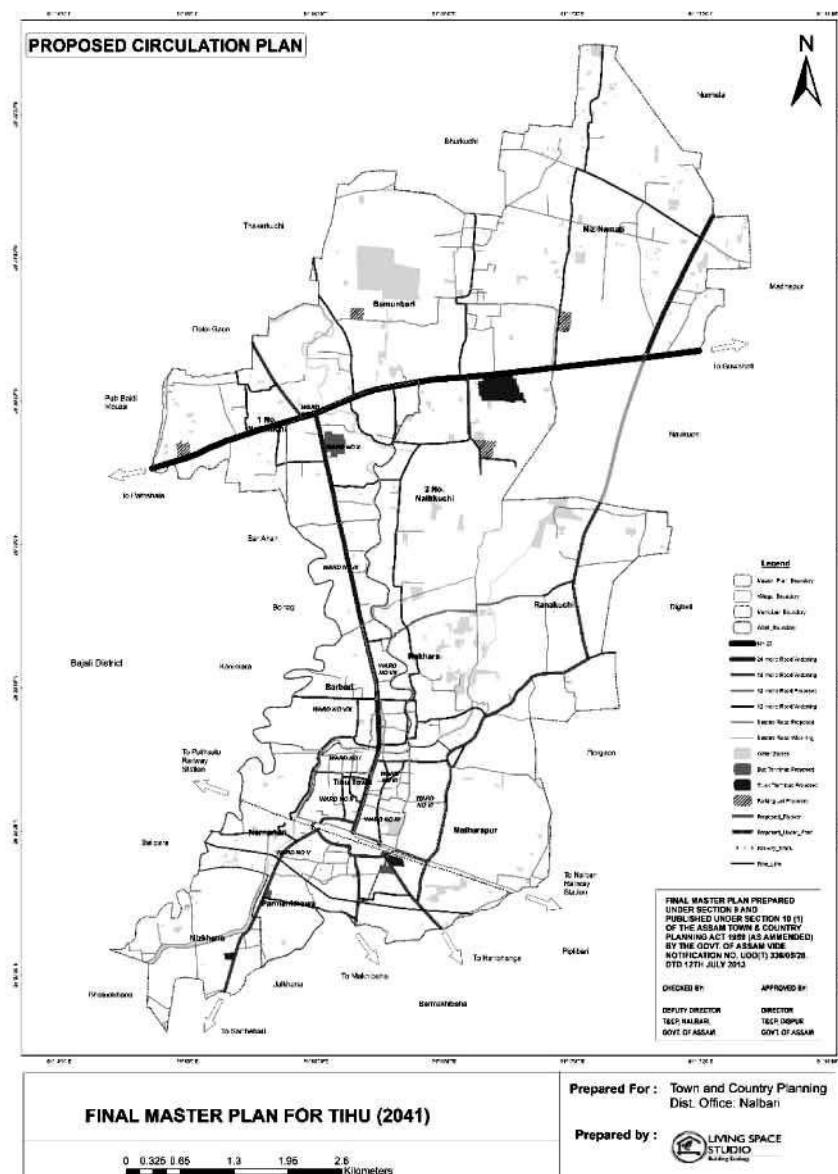
## **5.12 MAJOR PROPOSALS TO BE ON MAP INDICATING WIDTH OF ROAD AND RESERVATION OF LAND FOR THE PROPOSED ROAD OR WIDENING OF EXISITNG ROAD.**

The Tihu Master Plan -2041 recommends development of a hierarchy based arterial road network system comprising of primary arterial, subarterial and collector roads. Tihu town is fast transforming in its physical and socio-economic dimension. Traffic congestion, faulty parking, insufficient Road widths, decreasing Level of Service (LoS) of most of the roads, inefficient public transport, etc. are some of the problems of urban transport and transport network in Tihu town. Keeping all these shortcomings in view, the following proposals have been made in this Master Plan:

- **Road Widening and Extension:** The Tihu Town has been extended and from its 4 wards to 10 wards whose boundaries now reach upto the Tihu chowk at NH-27. The Tihu Feeder Road is the only major Road which connects the North to South of the Tihu Master Plan Area. Other alternative roads are either unpaved or narrow in width. Since Tihu Municipal boundaries have reached till NH-27, it is proposed that the width of Tihu Feeder Road may increase upto 24 meters along with necessary road signages and services. The Road connecting Kadamtal Chowk (Baksa District) at NH-27 upto Tihu-Haribhangha Road is proposed to be developed as alternative road with width upto 18 meters. This will serve as alternate road to escape the Tihu Feeder road Traffic.
- **Rail Over Bridge:** Tihu railway Station is located at the centre of the Tihu Municipal Board Area. Major Govt. offices such as Tihu Revenue Circle Offices, Banks, etc. as well as commercial establishments are located in the north of the Tihu Railway Station. 3 of the major growth centres namely Sarthebari Town, Makhabaha and Haribhangha, near Tihu Master Plan Area are located towards south of the Tihu Railway station and these have major trade & commerce relation with the Tihu Town. Tihu town has 2 major railway crossings at Tihu-Sarthebari Road and Khaliaguri-Haribhangha Road, which results in major traffic jams during Train crossings as well as accidents between Train and automobiles. For Smooth flow of vehicular traffic 2 new Rail Over Bridges are proposed at these locations. This will not only reduce the time between the 3 Growth centres and Tihu Town but also connect those Growth centres to the NH-27.
- **Highway Underpass:** To ease traffic congestion, a Highway Underpass is proposed at Tihu Chowk in NH 27.
- **Bus Terminus:** The intercity buses plying from Guwahati to Barpeta Road have stoppage at Tihu Chowk. Currently passengers board buses directly from the kerb of the National Highway. This has also resulted in mushrooming of unauthorized shops along the National Highway. Such activities have increased the chances of accidents from high speed vehicles and loss of life and property. A dedicated bus terminus for intermediary stoppages and for better regional connectivity has been proposed near Tihu Chowk at NH 27.
- **Truck Terminus:** Tihu in the past has had a rich history of Agro based Industries. Due to its better connectivity through Road and Rail as well as availability of undeveloped land, it has the potential to become a modern-day industrial hub. For the industrial corridor, a Truck Terminus has been proposed along the NH-27 which will serve the Industrial corridor as well as a parking spot for the vehicles going towards the state capital Guwahati. This will also stop the illegal parking on the roadsides which is an accidental hazard for the moving traffic on the NH-27.

- The entire road system of Tihu has been proposed to be classified into the following main categories.

Sl. No	TYPE OF ROAD	PROPOSED WIDTH	PROPOSED LENGTH
1	Arterial Road	24 Metres.	6.5 Kilometres
2	Sub Arterial Road	18 "	13.13 "
3	Collector Road	12 "	33 "
4	Local Road	8.5 "	56.5 "
5	National Highway	90 "	6 "
	<b>Total</b>		<b>115.13 Kilometres</b>



**Figure 5-1: Circulation Plan, Tihu Master Plan-2041**

**5.12.1 *Proposed Transport Development Strategy***

To improve the overall mobility in the region, the following policy imperative need to be taken by the authorities:

- i. Provision of efficient, reliable and accessible mass transportation system.
- ii. Integration of various mode of transport by way of evolving an integrated multimodal transport system.
- iii. Improvement in traffic management through short-term, medium and long-term interventions.
- iv. Encouraging public transport and non-motorized modes of traffic.
- v. Provision of environment friendly transport systems within the region.
- vi. Removal of traffic conflicts by way of grade segregation, provision of missing links, closure of avoidable junctions/cuts etc.
- vii. Development of regional corridors for Bye-Passing the regional traffic. Creating important transport nodes along the regional corridors for hassle free movement intercity traffic.
- viii. Development of adequate parking facilities across city and removal of Road-side encroachments.
- ix. Removal of traffic bottlenecks as a short-term measure.
- x. Encourage bicycles and E-bikes.

## **6. INFRASTRUCTURE, PUBLIC UTILITIES & SERVICES**

### **6.1 PHYSICAL INFRASTRUCTURE**

To ensure that urbanization happens sustainably, a well-executed delivery of urban services is a must. A sound infrastructure of urban services is necessary for combating diseases and poverty and improving the quality of life. Accordingly, the urban service profile refers to the current state of infrastructure and utility systems in the city. It indicates the adequacy or inadequacy of infrastructure services in terms of coverage, quantity, and quality, and attempts to identify the factors responsible for inadequate development of infrastructure services. It measures the gap between demand and supply of different infrastructure services, and examines the factors that explain the gap.

#### **6.1.1 Water Supply**

In Tihu Master Plan Area, the need for water is primarily met through private means like hand-pumps. The following table gives the percentage distribution of the sources of drinking water in Tihu as per the Census of India, 2011:

**Table 6-1:Main Source of Drinking Water in Tihu**

<b>Area</b>	<b>Percentage of HHs-</b>										<b>Total</b>
	<b>Tap water from treated</b>	<b>Tap water from un-treated source</b>	<b>Covered well</b>	<b>Un-covered well</b>	<b>Handpump</b>	<b>Tubewell/Borehole</b>	<b>Spring</b>	<b>River/Canal</b>	<b>Tank/Pond/Lake</b>	<b>Other sources</b>	
Municipality	7.3	0.2	0	0	90.7	1.6	0	0	0	0.2	100 %
Outside Municipal Boundary (inside MP Area)	0.8	0.2	0.2	0.33	96.93	0.96	0	0.23	0	0.35	100 %

*Source: District Census Handbook, Census of India 2011*

90.7% of the people in Tihu Municipal Area use hand-pumps as their main source of drinking water. Only 7.3% use tap water from treated sources. This figure is even lower outside the municipal boundary at only 0.8%. Groundwater in Tihu has high iron content and long-term consumption of it without proper treatment may cause ailments.

#### **6.1.1.1 Present Water Supply Status:**

A majority of the people in Tihu Master Plan area depend on their own sources for water like hand-pumps, tube-wells, etc. The Public Health engineering Department has been given the responsibility of supplying water in Nalbari district. The table below shows tap water connections in the following villages of the Tihu Master Plan area as on February, 2022:

**Table 6-2: Households with tap connection in Tihu MP Area**

<b>Villages</b>	<b>Number of Tap Connection</b>
Bamunbari	161
Mathurapur	167
Nannatari	148
Niz Namati	689
No. 1 Nathkuchi	171
Parmankhowa	6

Source: PHED Nalbari

The PHE department has been implementing the Jal Jeevan Mission (JJM) which aims to provide Functional Household Tap Connection (FHTC) with service level at 55 lpcd. With respect to Tihu Master Plan Area, the following targets have been set by PHED Nalbari as of February, 2022:

**Table 6-3: Ongoing Scheme and targets set**

<b>Name of Ongoing PWSS</b>	<b>FHTC Planned</b>
Bamunbari PWSS	221
Mathurapur PWSS	153
Nannatari PWSS	146
Nathkuchi PWSS	307
Niz Namati PWSS	745
Ranakuchi PWSS	437
Tihu New Chowk Bazar PWSS	199

Source: PHED Nalbari

#### **6.1.1.2 Water Demand Estimation for Resident in Tihu MP Area:**

As per the demand for water supply calculation, the existing water supply demand is 5.5 MLD, whereas the demand will increase to 6.05 MLD by 2031 and 6.6 MLD in 2041.

**Table 6-4: Water Demand Assessment**

<b>Description</b>	<b>2021</b>	<b>2031</b>	<b>2041</b>
Total Population of Tihu Master Plan Area	29913	32002	34082
Projected Water Demand (MLD)			
Total Water Demand @ 135 LPCD	4	4.5	5
15 % O & M loss	0.6	0.7	0.8

<b>Sub Total</b>	4.6	5.2	5.8
2% Fire Fighting	0.1	0.2	0.12
Total Water Demand	4.7	5.4	5.92
Grand Total Water Demand (Say)	<b>5</b>	<b>5.5</b>	<b>6</b>
Add 10% extra (Say for defense area, Floating population, Tourism, Service population etc.)	0.5	0.55	0.6
<b>Overhead Population Water Demand</b>	<b>5.5</b>	<b>6.05</b>	<b>6.6</b>

*Note: Cities provided with piped water supply where sewerage system is existing / contemplated- 135 lpcd (URDPFI Guidelines)*

### 6.1.2 Drainage System

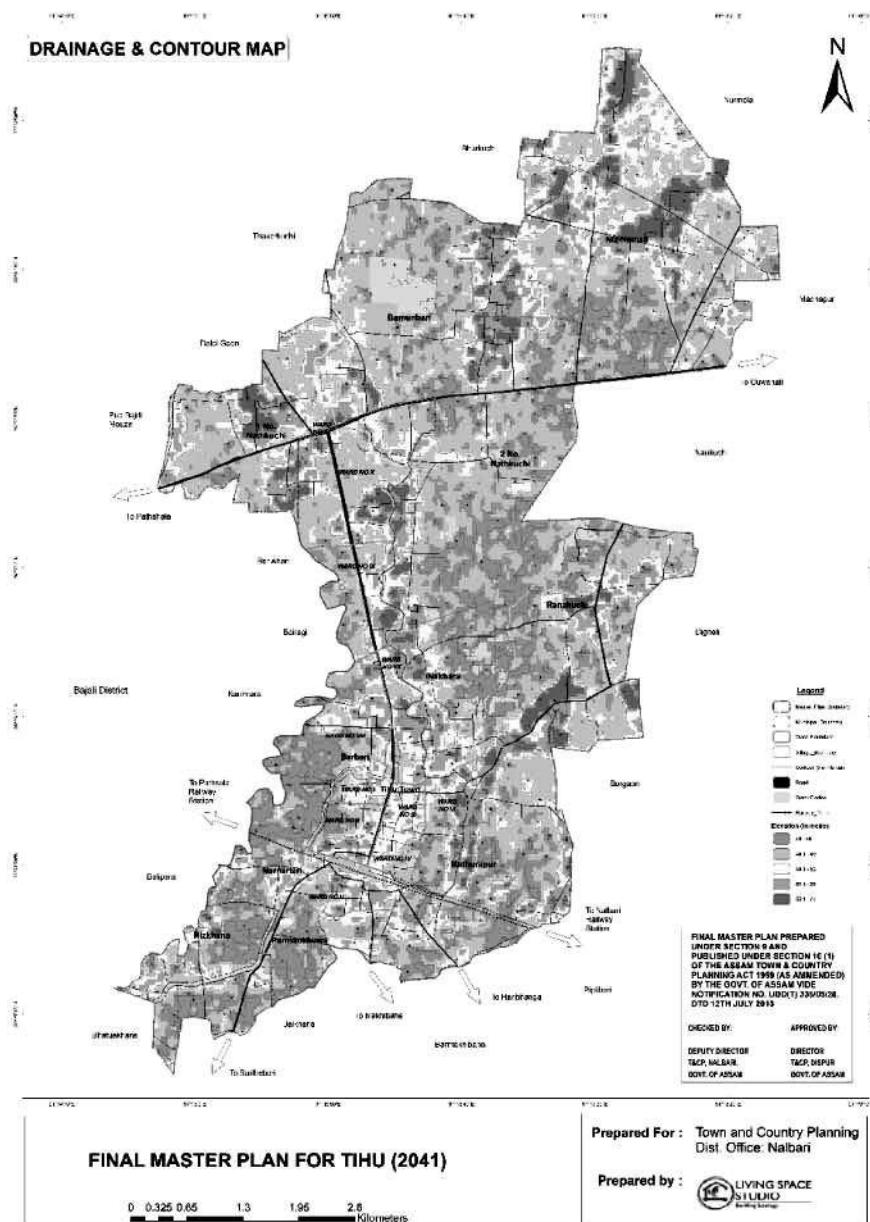
Tihu town does not have a scientific and well-defined drainage system. The drainage system is approximately 12 km and 720 houses are connected to it. There are 14 culverts and 2 outlets. According to the data collected from Tihu Municipal Board, the drains are cleaned manually either weekly or quarterly. As per the Census of India, 2011, 57.2% of the drains are open in Tihu Town. They are mostly kutcha unlined roadside drains carrying storm waste to nearby low lying areas. Largely due to insensitivity of the public, garbage is often thrown in these open drains, causing water logging problems during rainy days. The area near Tihu College is especially susceptible to water logging.

A lack of proper drainage system raises serious health and sanitation issues and causes public discomfort. Modernizing the drainage system is of utmost urgency to carry Tihu in the path of development. A scientific drainage system goes a long way in preventing vector borne diseases and saving what could otherwise be huge medical expenses. It should also be seen that while developing a sound drainage system for Tihu, the sewage waste is treated before discharging them to water bodies like the Tihu River. Tihu river is the identity of Tihu town, and conserving its sanctity is crucial.

This Master Plan proposes construction of drain length of 40 km. Out of this 1.39 km of pucca drain has been constructed by the Tihu Municipality and construction is going on for 15 km of pucca drain along the Feeder Road by PWD.



**Figure 6-1: Construction of drain along Tihu Feeder Road**



**Figure 6-2: Drainage & Contour/Relief Map, Tihu Master Plan**

### 6.1.3 Sanitation

Tihu Municipal Board has been implementing the Individual Household Latrines (IHHL) component of the Swachh Bharat Mission and the PHE department, Nalbari has been doing the same in the rural areas. In 15<sup>th</sup> August, 2017, the entire Nalbari district was declared 'Open Defecation Free'. 63 toilets have been constructed in Tihu town. In the villages, the beneficiaries of IHHL are selected on the basis of three categories. In 2012, a baseline survey was conducted to identify the number of households in rural India that did not have toilets. The survey formed the basis on which targets are set under the Swachh Bharat Mission (Gramin). To ensure that no one is left behind, two more categories were added: LOB households (Left out from Baseline) and NOLB (No one left behind) households. As per the data collected from PHED

Nalbari on 5<sup>th</sup> October, 2021, the following numbers of toilets have been constructed in the Tihu Master Plan Area across these categories of beneficiaries:

**Table 6-5: Total Household Toilet Construction**

Name of Village	Base Line Survey-2012	Left Over Baseline-2012 (LOB)	No One Left Behind
Bamunbari	14	-	-
Barbari	47	-	-
Nakhara	74	-	8
Nannatari	-	143	10
Niz Khana	-	123	29
Niz Namati	289	-	32
No. 1 Nathkuchi	408	-	22
No. 2 Nathkuchi	139	-	84
Parmankhowa	-	26	32
Ranakuchi	123	-	-

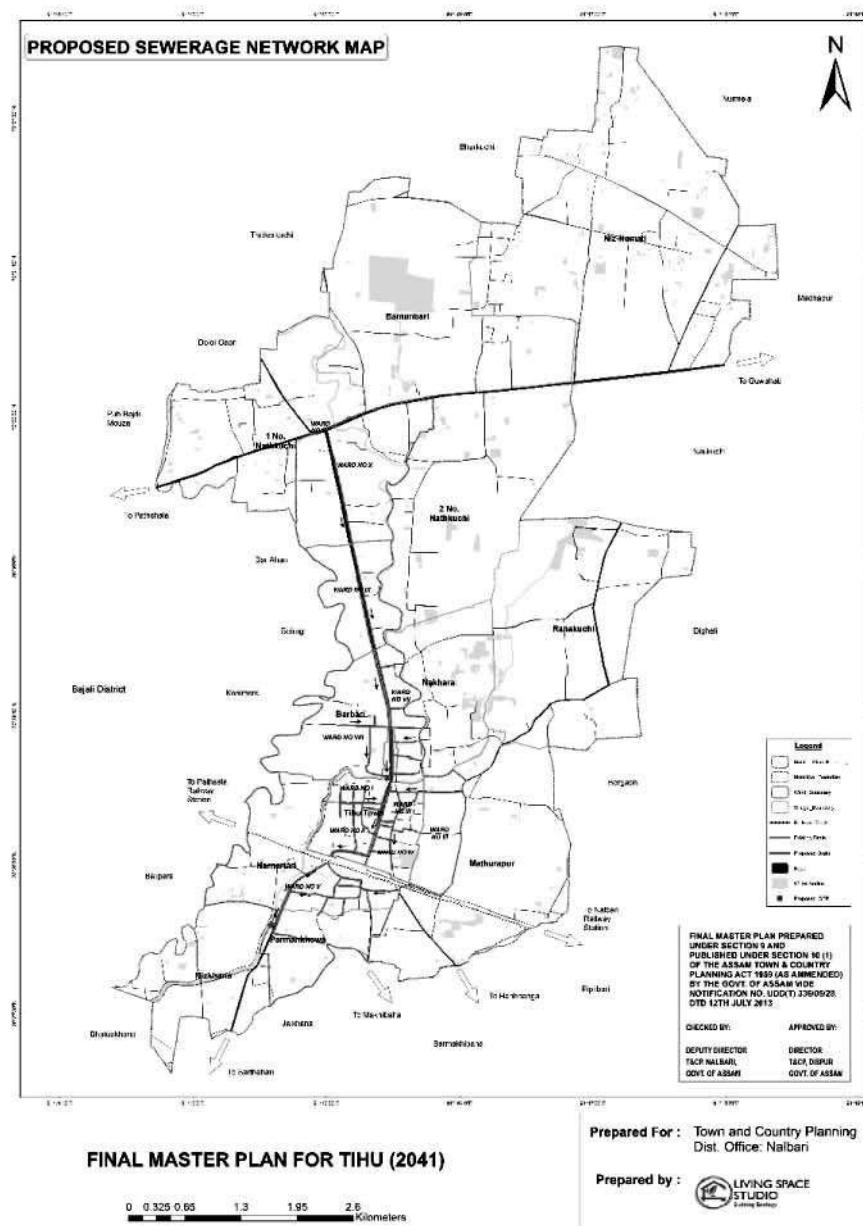
*Source: PHED Nalbari*

There is also 1 Community Managed Sanitary Complex- CMSC in Bamunbari. Further, about 187 toilets have been constructed to the ‘Newly Emerging Households’. Under ‘Swachh Bharat Kosh (SBK)’ conversion of dysfunctional toilets are being done. In Tihu Master Plan Area excluding municipality, over 265 toilets have been constructed under the scheme till October, 2021.

#### **6.1.4      Sewerage Network**

A proper sewerage system includes collection of sewerage from source of generation through sewer network, treatment using appropriate available efficient technology, and safe disposal to natural water bodies. Tihu town does not have a well-integrated sewerage network. The drains here carry a mixture of domestic sewage and storm sewage. The individual households have their own septic tanks, soak pits, artificial pond for treatment of their liquid wastes. The effluent is released untreated into nearby drains and low-lying areas.

Untreated sewage is a leading cause of pollution of water bodies in Tihu, causing contamination of land and water, and degradation of the environment. In this context, establishment of Sewage Treatment Plant using affordable yet efficient technology is crucial. 2 Sewage Treatment Plant (STP) have hereby been proposed near Tihu River. The treated sewage water can be reused for different purposes like horticulture, irrigation, fire-fighting, industrial cooling, etc. thereby decreasing the water demand from sources like underground, rivers, lakes, etc.



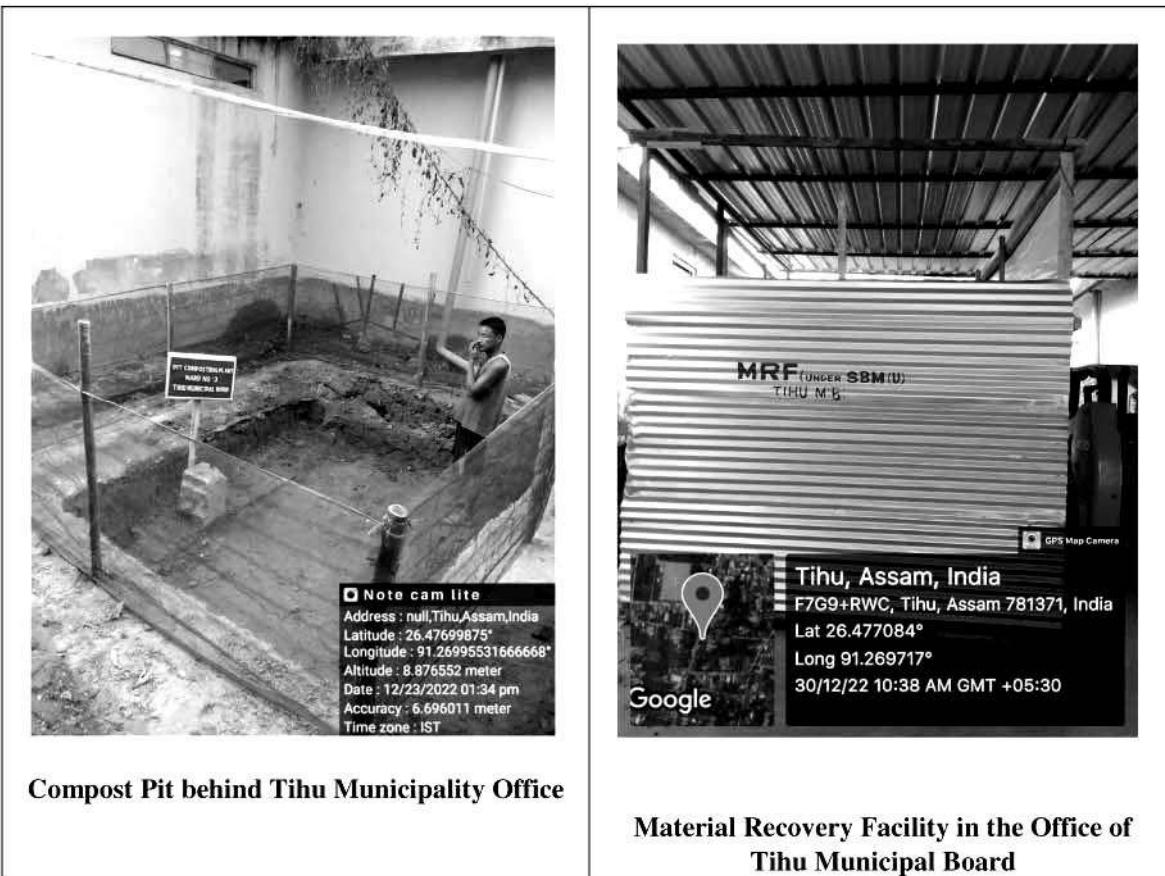
**Figure 6-3: Sewerage Map, Tihu Master Plan**

### **6.1.5 Solid Waste Management**

Solid Waste Management refers to the practice of collecting, treating and disposing municipal wastes originating from materials which have lost its purpose and are of no value, in accordance with the principles of public health, engineering, economics, aesthetics, etc. The sources of municipal solid wastes are- (i) residential wastes (ii) commercial wastes (iii) wastes from rituals (iv) desilting wastes (v) treated bio-medical wastes.

According to the Solid Waste Management Rules, 2016, all the ULBs are responsible for Solid Waste Management activities within their respective jurisdiction. In Tihu, the waste collected are disposed in a 1 bigha land near the Power Grid office. However, a 3.5 bigha land has been identified by the Tihu

Municipal Board at Doloigaon village for solid waste management. Further, a compost pit measuring 10ft\*12ft has been set up behind the Tihu Municipality Office. Most of the households in the newly formed wards of Tihu town practice composting at home. To promote waste segregation at source, coloured dustbins have been distributed to the masses. A Material Recovery Facility(MRF) measuring 16ft\*9ft has been set up in the Office of Tihu Municipal Board to promote Solid Waste Management.



#### 6.1.6 *Electric Sub-Station and Major Transformers*

The following table shows the electric sub-stations and number of transformers in Tihu Master Plan area as on November, 2021:

**Table 6-6: Electric Sub-Station and Transformers**

Village	Sub-Station	No. of Transformers
Bamunbari	Nathkuchi 33/11 KV CR	2
Barbari	Tihu 33/11 CR	2
Mathurapur	Tihu 33/11 CR	2
Nakhara	Tihu 33/11 CR	2
Nannatari	Tihu 33/11 CR	3
Niz Namati	Nathkuchi 33/11 KV CR	10
Nizkhana	Tihu 33/11 CR	2

No. 1 Nathkuchi	Nathkuchi 33/11 KV CR	10
No. 2 Nathkuchi	Nathkuchi 33/11 KV CR	4
Parmankhowa	Tihu 33/11 CR	3
Ranakuchi	Tihu 33/11 CR	1
Tihu Town	Tihu 33/11 CR	11
<b>Total</b>		<b>52</b>

Source: APDCL, Tihu Sub-Division

The number of connections under various categories is as follows-

**Table 6-7: Consumers under different categories**

	Jeevan Dhara	Domestic-A	Domestic-B	Commercial	Industrial	Others
Tihu Municipal Area	11	769	27	292	14	34
Tihu Master Plan Area excluding the Municipal Area	265	5133	4	189	33	54
<b>Total</b>	<b>276</b>	<b>5902</b>	<b>31</b>	<b>481</b>	<b>47</b>	<b>88</b>

Source: APDCL, Tihu Sub-Division

It is proposed that aerial electricity cables may be replaced by underground electricity cables. It may be noted that trucks from the FCI godown frequently pass through roads like Tihu-Sarthebari road and Feeder road. The low hanging cables are always at a risk of damage from these trucks. Damaged wires also presents the risk of electrocution. Underground cables are an alternative to haphazard aerial cables which taints the aesthetic appeal of an area. Besides, these are less susceptible to damage from storm and wind which will ensure a smooth supply of power.

## 6.2 SOCIAL INFRASTRUCTURE

Health and education sector forms the backbone of social infrastructure. It also includes other facilities like banks, post offices, police stations, playgrounds, etc. Social Infrastructure supports the quality of life and access to it is crucial for an all-round human development.

### 6.2.1 Education

There are about 41 educational institutions in the Tihu Master Plan Area with approximately 3,687 students and 281 teachers. The following table shows the different categories of educational institutions along with the number of students and teachers as on November, 2021:

**Table 6-8: Educational institutions in Tihu MP Area**

Standard	No. of Institutions	No. of Students	No. of Teachers
Primary Schools (A few of these are integrated, offering Middle school courses too)	28	1385	90
M.E schools	3	99	22
High Schools	5	713+	80+
College for general education including PG Courses	1	2500+	53
B.Ed/ D.El.Ed College	1	200+	

Source: District Elementary education Office, Nalbari



The Pupil Teacher Ratio (PTR) for Primary, Middle and High Schools are 15:1, 5:1 and 9:1 respectively. The Right of Children to Free and Compulsory Education (RTE) Act, 2009, in its Schedule lays down PTR for primary and upper primary level. At primary level, the PTR should be 30:1 and at the upper primary level, it should be 35:1. The Rashtriya Madhyamik Siksha Abhiyan (RMSA) framework stipulates that the PTR at the secondary level should be 30:1. Comparing these ratios, the PTR in the

Tihu Master Plan area is found to be satisfactory. However, a few schools in the Master Plan area have low enrollment ratio.

In the Tihu Master Plan Area, there are around 8 private schools. There are 2 private junior colleges namely, Aryabhatta Academy, Tihu and Sankardev Academy, Tihu.

Besides this, there are also vocational education institutions in Tihu Master Plan area. Under the Building & Other Construction Workers' (RE & CS) Act, 1996, 1 skill development training centre has been running at Nannatari for the registered construction workers under Building & Other Construction Workers' Welfare Board since April, 2018 where 1561 trainees have completed training till October, 2021.

The Master Plan envisages the establishment of integrated schools in new areas rather than opting for various levels of educational institutional facilities separately. Similarly, crèches and pre-nursery schools are permissible in the residential use as a part of the Mixed use Policy. In all educational institutions, proper provision for differently abled children shall be made.

### 6.2.2 Health

An adequate and well-distributed health infrastructure is crucial for efficient and timely response to health crisis. A quality health infrastructure plays a vital role in controlling various health related parameters like life expectancy, mortality rate, etc. to respectable level, and is also found to have a positive impact on speedy recovery from diseases. A sound health system is accessible and delivers high quality care at reasonable price.

The following table shows the number of healthcare institutions in the Tihu Master Plan Area as per the data collected from the Office of the Joint Director of Health Services, Nalbari:

**Table 6-9: Number of health institutions in Tihu MP Area**

Health Institutions	Total
Civil Hospital	-
Dispensaries	2
PHC	3
FRU	1
Model Hospital	1

*Source: Office of Joint Director of Health Services, Nalbari*

In the Tihu Master Plan Area, there are 15 doctors and 36 paramedical staffs working in these institutions. In 2021, there were 6922 outdoor patients and 697 indoor patients. About 624 patients were referred to other towns and cities. The total number of beds available is around 80. There is no private hospital or nursing home in the master plan area. However, a number of private clinics are present. The Master Plan Area needs a state-of-art health infrastructure to effectively deal with health emergencies and to reduce the need to rush to other cities for medical treatment.



**Figure 6-4: Tihu F.R.U**

**6.2.3      *Recreational Facilities*****6.2.3.1      *Parks***

As of now, there is no functioning parks within the limits of Tihu Town. However, a park construction project has been sanctioned near Tihu College.

**6.2.3.2      *Playgrounds***

There are 4 playgrounds in Tihu town, namely- Tihu College Playground, Tihu Boys High School Playground, Basanti High School Playground and Bharati High School Playground. These playgrounds are not up to standard and are ill-equipped to smoothly accommodate crowd during social and political gatherings. To ensure that playgrounds and open spaces are protected and not converted to other land-uses, they are hereby declared as 'No-Construction Zone'. Solely the activities that can upgrade the recreational and sports infrastructure around these will be permitted.

**6.2.4      *Communication Services and Other Facilities*****6.2.4.1      *Police station***

There is 1 police station in the Tihu Master Plan area along the Tihu-Feeder Road.

**6.2.4.2      *Fire Service***

The Tihu Master Plan area has 1 Fire & Emergency Service office at No. 1 Nathkuchi. To ensure prompt action during fire accidents and explosions, it is recommended that existing and proposed Urban Water Supply Schemes incorporate the provision of fire hydrants in market places. Expertise should be sought from Town & Country Planning as well as Fire & Emergency Services to identify strategic locations to the install fire hydrants so that fire-fighters can swiftly tap into water utility's water supply. In this Master Plan, the following areas have been demarcated in the Zoning Map for setting up fire hydrants.

1. Along Feeder Road, near Tihu Chowk
2. Near Tihu Police Station
3. Nannatari, along Tihu-Haribhangha Road
4. Near FCI Godown, Tihu-Sarthebari Road

**6.2.4.3      *Postal service***

There is 1 sub-post office at Tihu town. Bamunbari, Barbari, Nakhara, Nathkuchi, and Niz Namati has 1 branch office each.

**6.2.4.4      *Banks***

There are 5 commercial banks in Tihu town, namely- SBI, HDFC, UCO, Central Bank and Bandhan Bank. There is 1 Regional Rural Bank, i.e. Assam Gramin Bikash Bank and 1 Small Finance Bank i.e. Northeast Small Finance Bank. There is a cooperative bank, namely, Assam Co-Operative Apex Bank Limited. There are also Customer Service Points (CSP) and Business Correspondents to deliver banking and financial services especially to the rural areas.

**6.2.4.5      *Cremation and Burial Ground***

There are quite a few cremation grounds by the Tihu River. None of them are equipped with modern equipment like electric crematorium. There are 2 cremation grounds and 1 burial ground, all of them in vicinity with each other near Tihu College. There are 2 more cremation grounds in ward 9 and ward 10.

## **7. ENVIRONMENT AND CITY BEAUTIFICATION PLAN**

### **7.1 INTRODUCTION**

Tihu town is surrounded by diverse land-uses like industries and important road networks as well as natural endowments like farmlands and river. However, over the years very little has been done for the beautification of the town. This Master Plan proposes an enhanced recreational land-use while preserving the natural endowment elements and promoting ecological sustainability. Trails, parks, community gardens can be additions to the town which will not only improve the aesthetic characteristics but will also have a calming effect on the minds of people. This will propagate a high quality living environment and improve physical health and mental well-being.

Furthermore, for creating a sustainable environment, citizen participation should be promoted. As the standard of living of the people improves, the per capita waste generation increases. Awareness drives should be conducted to bring about a positive community behavioural change ranging from control of greenhouse gases to reduction of single use plastics. Innovative technologies in partnership with different groups and organization should be embraced.

The aim of this Master Plan is to make the town a healthy and an enjoyable place to live in. Diversity of choices to the citizens should be expanded by constructing theatres, community halls, libraries, museums. Proper building codes is to be enforced. It has been proven that in the event of calamities, a well governed and scientifically planned city has lower risk of fatalities and is more resilient.

### **7.2 CITY BEAUTIFICATION PLANS AND PROPOSALS**

#### **7.2.1 *Median Barriers***

Median Barriers are proposed along Tihu Feeder Road which is a major entrance point to Tihu town. Besides carrying general traffic, this road is heavily used by trucks of FCI godown located in Tihu-Sarthebari road. The median barrier should be built to ease and streamline turbulent vehicular traffic. It will ensure a safe and sound journey and will reduce the chances of a fatal crash. Landscaped with grass or trees or decorated with stones and bricks, they can make the roads look vibrant. They can secondarily serve as green areas, beautifying roadways.

#### **7.2.2 *Roadside Plantation***

One of the best example of planned tree plantation along city roads in India is New Delhi. It is an exemplary model of architectural, structural and aesthetic excellence. Some of the remarkable features that can be attributed to its artistry are:

- Use of structurally large trees with very tall, straight trunks that form excellent sprawling crowns.
- The use of indigenous species that are hardy, sturdy and durable that makes them easy to grow and maintain. They are able to withstand the extreme environmental pollution from toxic automobile exhausts that usually threaten delicate trees.

- Evergreen varieties of trees used which lends to year-round green effect and protection from severe weather conditions.
- The entire expanse of open space between the concrete buildings and roads covered, creating a soothing visual effect.
- Avenues planted with single kind of trees that offers a glorious collective impact. The consistency, homogeneity of structure, texture and pattern it creates has helped bind the entire city together.
- Planting trees close to the verges, has helped separate vehicular and pedestrian traffic.
- All flowering species of trees that are structurally small, short-lived and difficult to grow and maintain have deliberately not been used for roadside plantation. Instead these have been exclusively planted in parks and various open spaces where they grow well and provide colour and beauty to the city.

### **Benefits of road side planting**

- Reduced soil erosion: holds soils in place
- Remove dust and other pollutants from the air, protecting crops and road-side communities  
Wind break
- Flood control: slow and absorb road run-off
- Carbon dioxide sequestration
- Provide important pollinator habitat (honey production)
- Provide shade and keep the road cool for road users
- Beautification

### **7.2.3 Urban Agriculture and Urban Forestry**

#### **7.2.3.1 Urban Agriculture**

Urban agriculture can be described as the growing of plants and the rearing of animals primarily for food and other domestic use within a city or a town and its environs. It also involves activities such as the production, processing, marketing, and delivery of farming products. Urban agriculture consists of a number of production systems. They vary from domestic production and household level processing to large scale agriculture. This is usually done within the city peripherals. Urban agriculture is known to improve the livability of cities and towns and contribute to their sustainability. Urban forestry can be defined as the management of tree population in urban settings for the purpose of improving the urban environment. Besides providing sociological, economic and aesthetic benefits, urban forestry can be a tool for mitigating carbon dioxide emissions as trees can help in its sequestration. It advocates the role of trees as a critical part of the urban infrastructure.

Types of Urban Agriculture	<ul style="list-style-type: none"> <li>• Backyard Gardens</li> <li>• Tactical Gardens</li> <li>• Street landscaping</li> <li>• Forest gardening</li> <li>• Greenhouses</li> </ul>
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	<ul style="list-style-type: none"> <li>• Rooftop gardens</li> <li>• Green walls</li> <li>• Vertical farms</li> <li>• Animal husbandry</li> <li>• Urban beekeeping</li> <li>• Aquaponics</li> </ul>
Benefits of Urban Agriculture	<ul style="list-style-type: none"> <li>• Food Security</li> <li>• Healthy community participation</li> <li>• Offsets urban heat island effect</li> <li>• Decreases storm water runoff</li> <li>• Boost the local economy</li> </ul>

#### **7.2.3.2 *Urban Forestry***

Urban forestry or Nagar Van (Urban Forests) can be defined as the raising and management of trees in and around urban areas. Urban forestry is the art, science and technology of managing trees and forest resources in and around urban community ecosystems for sociological, economic and aesthetic benefits that trees provide for society.

Urban forests will work as lungs of the cities and will primarily be on the forest land in the City or any other vacant land offered by local urban local bodies.

#### **7.2.4 *Rainwater Harvesting***

Rain water harvesting (RWH) is the activity of direct collection of rain water. It involves the process of optimum utilization of the natural resource, i.e., water. With urbanization, increasing concrete constructions have reduced infiltration of rainwater into the sub-soil and recharging of ground water has diminished which has depleted aquifers. Many states in India has therefore formulated mandatory policies and laws to encourage construction of artificial recharge and rainwater harvesting structures. Rain water harvesting methods can be easily practiced in offices, parks, temples, and individual houses. RWH from roofs consists of collecting, storing, and putting to use rainwater from houses or any constructions. Rainwater can also be collected through percolation pits, open wells, or bore wells. The artificial recharge of ground water aims at augmentation of ground water reservoir by modifying the natural movement of surface water utilizing suitable civil construction techniques. India faces an erratic monsoon, and RHW can be an effective tool in water management and conservation.

#### **7.2.5 *Riverfront Development***

Riverfront development can be undertaken as an additional buffer. Public spaces can be created to let residents enjoy the riverfront and its surrounding. Parks, walkways, and spaces to host festivals can be developed in order to enhance community culture and quality of life. The stretches of Tihu River can be developed as fully accessible immersion ghat with recreational facilities such as yoga and meditation centre, open air theatres. No permanent structure is to be permitted in the buffer zone. Felling of trees should not be allowed at such areas.

#### **7.2.6 *Pond Rejuvenation***

There are quite a few neglected and unkempt ponds in Tihu. For instance, near Hari Mandir, SD College, Circle Office etc. These can be developed to ensure water sustainability and water conservation. The rejuvenated ponds may be used for cultural and social events. Also the infrastructure to facilitate swimming by the citizens may be set up. This is strengthen the sense of community in the town.

#### **7.2.7 *Relocation of Street Vendors***

Shopping complexes may be developed for relocation of street vendors. Street vendors are often responsible for traffic congestion due to the haphazard manner in which they conduct their vocation. The complexes are to have off street parking provisions.

#### **7.2.8 *Garbage bins***

Areas of high passersby like bus stands, auto stands, and marketplace have high waste generation potential. Without proper waste disposal facilities, these places are prone to be littered. Dual bin structure, coloured green and orange for organic and inorganic waste respectively should be installed to facilitate source separation. Proper graphics and labels should also be used for clear communication.

#### **7.2.9 *Road Signage***

The purpose of street signage is to make it easy for visitors and residents to navigate around. It should highlight major locations in an appealing and informative manner. Old, cracked, faded and obsolete signs needs to be replaced, maintained or removed permanently.

#### **7.2.10 *Street Furniture***

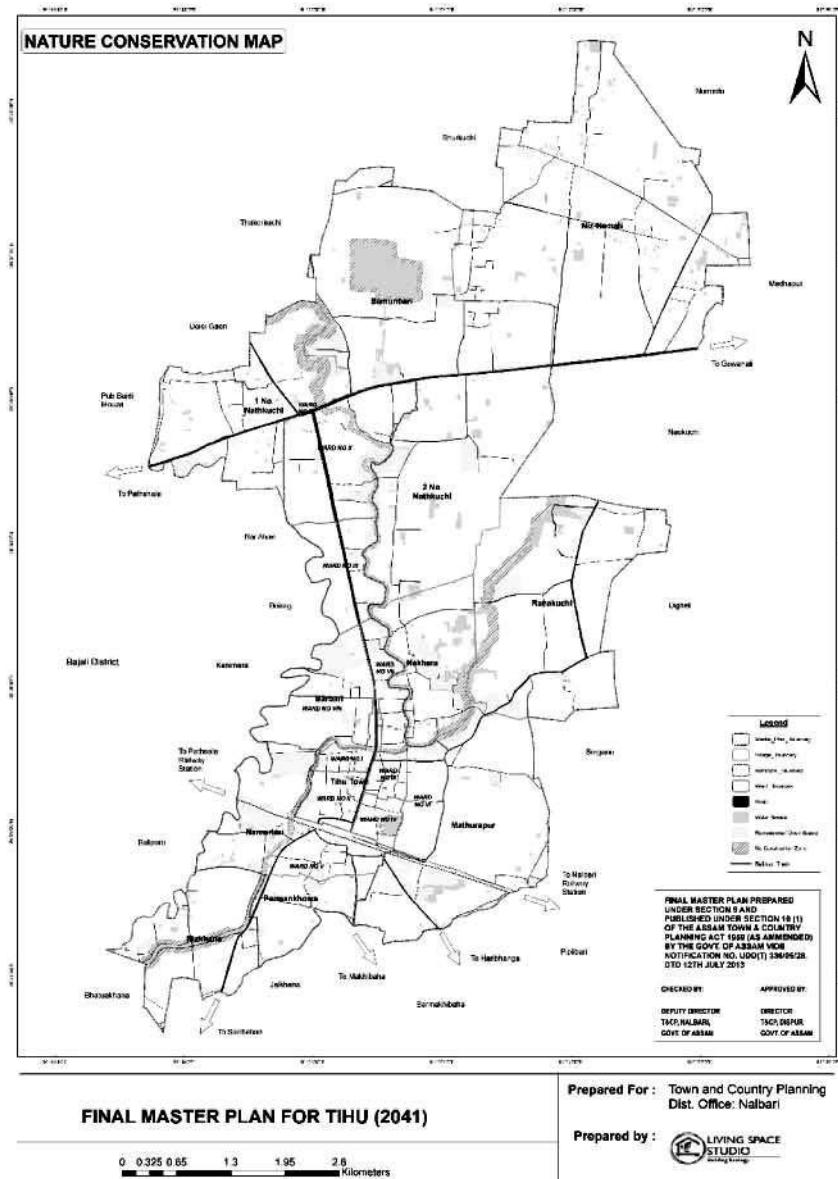
Street furniture including benches in areas of high pedestrian traffic and/or areas of interest is very important and the design must take into consideration the local context in terms of weather resistance and material selection.

#### **7.2.11 *Traffic Signal and Zebra Crossing***

Traffic signals help to control drivers' behavior. In Tihu town, some of the points that require traffic signals are: the intersection near SBI; the intersection at Gandhi Bhaban road; and the intersection of Sarthebari road and Station Road. Traffic Signals organize vehicular movement and reduce the chances of accidents. Countdown signal timers may be installed at locations of high pedestrian traffic, which would help them to gauge the time they have to make the crossing.

### 7.2.12 No-Construction Zone

The banks of Tihu River and all major water bodies is demarcated as 'No Construction Zone' for protection of the fragile environment and prevention of residential encroachment. This zone will extend 15 metres in Municipal Board areas and 50 metres in rural areas from the banks of natural water bodies. No permanent construction will be permitted in the No-Construction Zone. In case, other land-uses such as 'industrial' is in vicinity or extending into this zone, their activities will be regulated and no physical alteration of the land will be permitted. The No-Construction Zone will be a sustainable zone to protect sensitive landscapes from negative external pressures.



**Figure 7-1: Nature Conservation Map with demarcation of 'No Construction Zone' in Tihu Master Plan Area**

## **8. LAND USE PLAN**

### **8.1 EXISTING LAND USE**

The Tihu Master Plan Area consists of 11 revenue villages and Tihu Municipal Board area. It covers a total area of 3232.82 hectares/ 32.33 sq. km. Predominantly an agriculture based land, there are also low lying marshy lands and ecologically fragile areas such as along the Tihu River. Illegal construction and lack of scientific land-use control has led to unplanned and haphazard growth resulting in the natural drainage to get affected in many areas. Natural and semi-natural vegetated areas have witnessed exploitation which has given rise to a threat of potential health hazards in addition to diminishing the aesthetic appeal of the Master Plan area.

### **8.2 LAND-USE PATTERN**

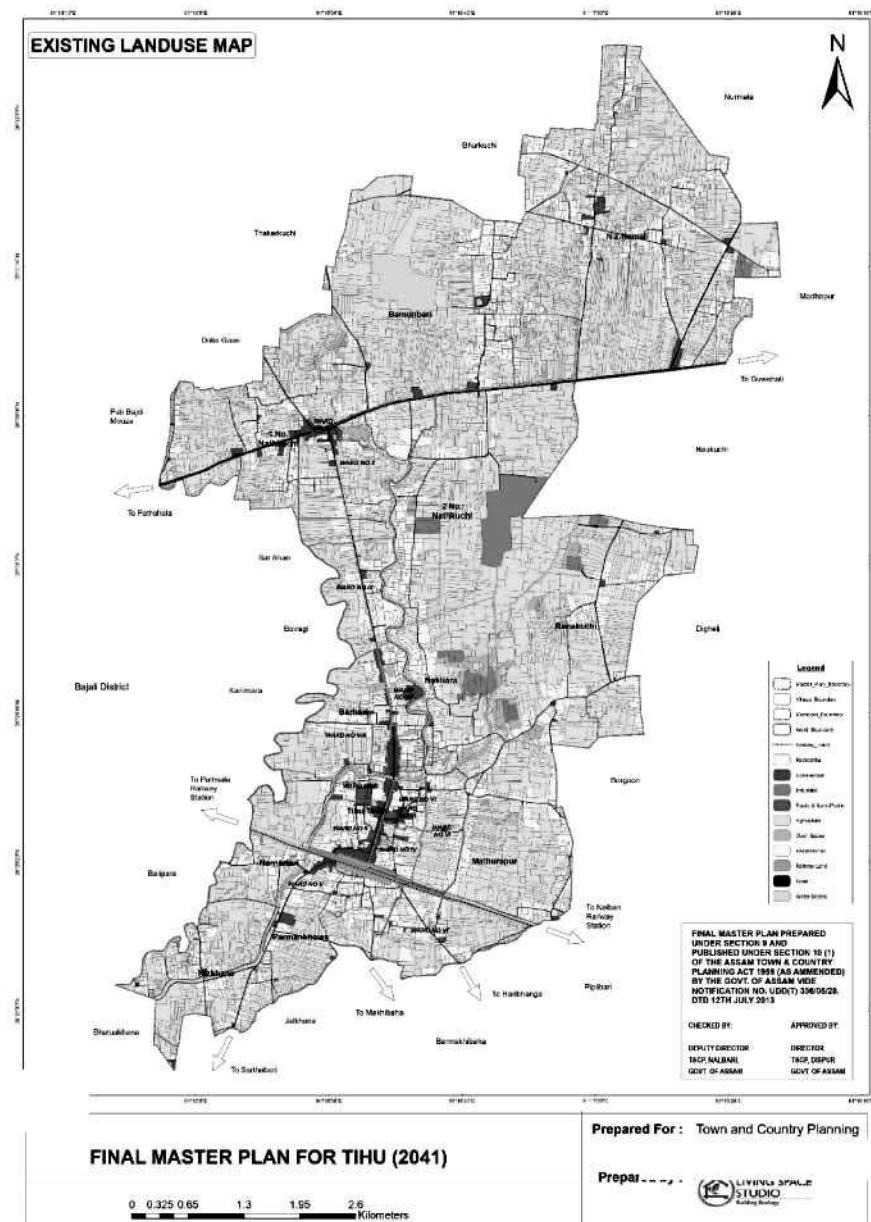
Land use survey was conducted for the Tihu Master Plan area by Town & Country Planning office, Nalbari.

**Table 8-1: Existing Land-use Classification**

Sl. No.	Land Use	Area (Sq Km)	% of Total Developed Area	% of Total Area
1	Residential	7.77	73.86	24.03
2	Commercial	0.32	3.04	0.99
3	Public & Semi public	0.32	3.04	0.99
4	Industrial	0.63	5.99	1.95
5	Transportation	0.97	9.22	3.00
6	Recreational/ Open Space	0.51	4.85	1.58
<b>Total Developed Land</b>		<b>10.52</b>	<b>100.00</b>	<b>32.54</b>
7	Agriculture	20.48		63.35
8	Water Bodies	1.33		4.11
<b>Total Master Plan Area</b>		<b>32.33</b>		<b>100.00</b>

It can be seen from the above table that 7.77 sq. km or 73.86% of the total developed area is under residential land-use which accommodate primarily single family, detached houses. 0.32 sq. km or 3.04% of the total developed area is under commercial land-use. Commercial establishments have developed along the Feeder road and has extended to areas near the railway station. Industries occupy 0.63 sq. km or 5.99% of the total developed area. Northeast Mega Food Park housing food processing units in Nathkuchi is one such industry to reckon with. 3.04% of the total developed area is under public & semi-public land use. This is not enough and indicates a possible inconvenience and discomfort of the public in accessing public services. Transportation comprising of road networks and railways cover 0.97 sq. km or 9.22% of the total developed area. Recreational/Open Space land-use is 0.51 sq. km or 4.85% of the total developed area. Recreational land-use is not up to standard indicating a lack of proper space for the people to relax and unwind. Agriculture occupies the dominant land-use in the Master Plan area,

comprising 20.48 sq. km or 63.35% of the total Master Plan Area. Over three-fifth of the total area is under agriculture.



**Figure 8-8-1: Existing Land-Use, Tihu Master Plan Area**

### 8.3 LAND-USE INTERACTIONS

The survey conducted by Town and Country Planning, District Office Nalbari in 2022 reveals that the planning area has mixed land-use especially within the Municipal area. This has created inefficient and non-conforming land-use and loss of inter-relationship between various land-use. It is observed that quite a no. of land-use does not have functional relationship with the surrounding area. A few of them cause nuisance in the area where they exist at present. Relocation of such incompatible land-use to suitable site is, therefore desirable.

#### **8.4 PROPOSED LAND USE PLAN**

All areas under the Tihu Master Plan have been designated as one of the following land use-zones, which are residential, commercial, industrial, public- and semi-public, recreational, transportation and agricultural.

The over-all land use break-up for the new proposed Planning Area measuring 32.33 sq. km is as follows:

**Table 8-2: Proposed Land-Use Classification**

Sl. No.	Land Use	Area (Sq Km)	% of Total Developed Area	% of Total Area
1	Residential	8.28	52.14	25.61
2	Commercial	1.02	6.42	3.15
3	Public & Semi public	1.01	6.36	3.12
4	Industrial	1.32	8.31	4.08
5	Composite Use	0.66	4.16	2.04
6	Transportation	1.6	10.08	4.95
7	Recreational	1.99	12.53	6.16
<b>Total Developed Land</b>		<b>15.88</b>	<b>100.00</b>	<b>49.12</b>
8	Agriculture	14.94		46.21
9	Green Belt Proposed	0.18		0.56
10	Water Bodies	1.33		4.11
<b>Total Master Plan Area</b>		<b>32.33</b>		<b>100.00</b>

- *Residential Area*

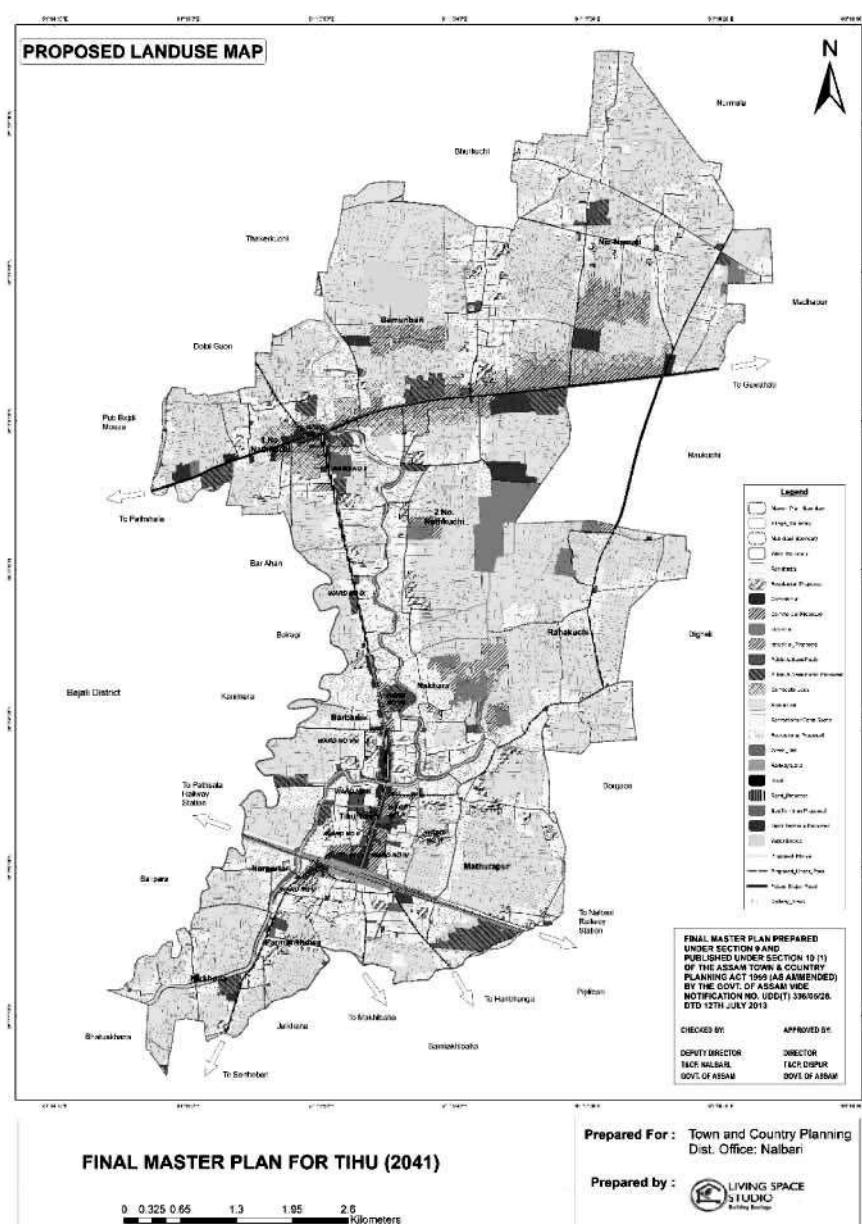
8.28 sq. km or 52.14% of the total developed area has been earmarked for residential land use. The residential areas are proposed to be developed as self-contained units with provisions of all community facilities and services, and work places within reasonable distances duly served by an efficient circulation system. Accessibility of the property by road and connectivity with the important nodes of the master plan area is proposed.

- *Commercial Area:*

Commercial activities are critical to the economy of the community. 1.02 sq. km or 6.42% of the total developed area has been earmarked for commercial land-use. At present, retail trade is mixed with wholesale trade in the town which creates problems like traffic obstruction during loading and unloading activities. It is proposed that new wholesale trade be shifted along the NH 27. Commercial establishments like hotel accommodation, car dealers, gas stations may be along the highway. A lot of unregulated businesses have also sprung up in the Master Plan area which may be accommodated to ensure public convenience and a sanitary environment to conduct their vocation.

- *Composite Land-Use:*

In the composite zone, the occupation of the land will be allocated as per prospective uses such as residential, commercial or light industries. The idea is to encourage human interaction and promote flexibility and more authentic neighbourhood. Composite zoning will enable compatible locations to attract the much needed economic development projects, ensuring harmonious development of the area with adjacent properties. In the Tihu Master Plan Area 0.66 sq. km or 4.16% of the total developed area has been earmarked as composite zone. The Zone has been proposed bordering the proposed commercial zone along NH 27.



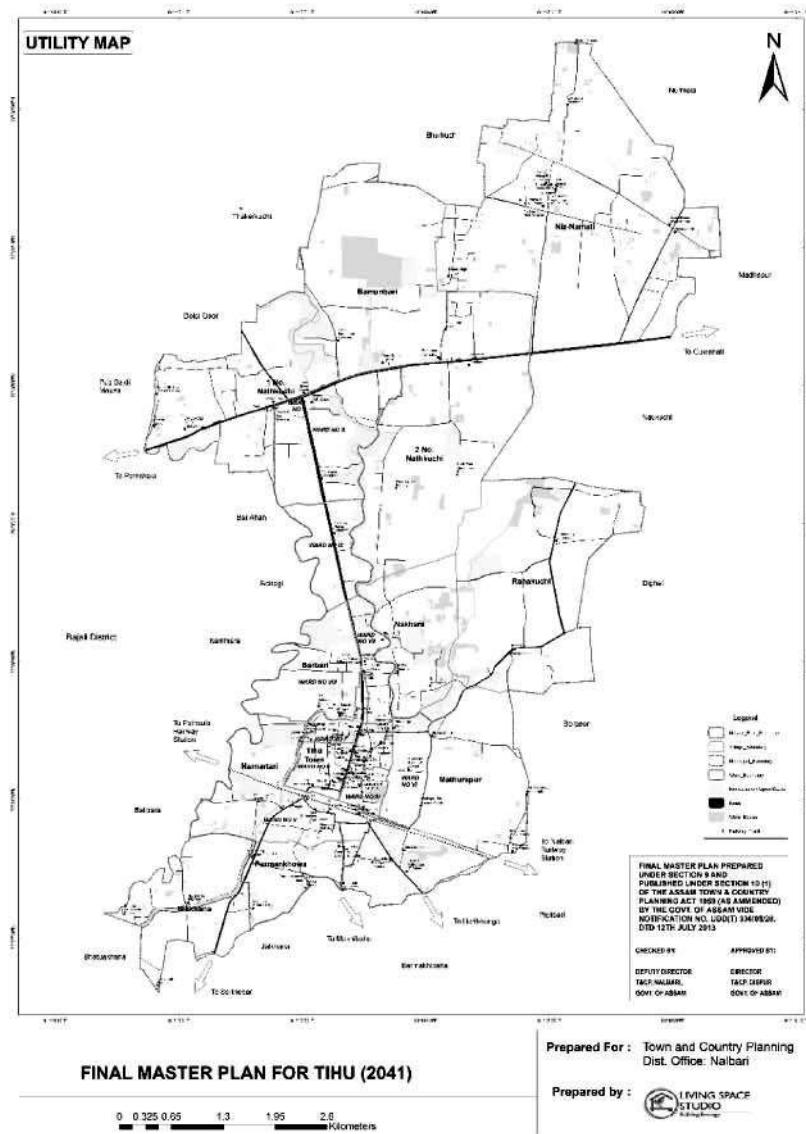
**Figure 8-2: Proposed Land Use Map, Tihu Master Plan-2041**

- *Industrial Area*

1.32 sq. km or 8.31% of the total developed area has been earmarked for industrial land-use. Tihu Master Plan area is favourably located with advantages of a good transportation network and proximity to market. To utilize this, a declaration was made by the Government of Assam vide Notification No. RLA192/2017/30 dated 18<sup>th</sup> January, 2018, that the area within 1 km beyond 500 meters on either side of the NH 27 from Jalukbari in Kamrup (metro) district to Tihu in Nalbari district shall be “Industrial Zone”, excluding the tribal belts, notified forests, and wetlands. This has been taken into consideration in the proposed land-use of Tihu Master Plan. Zones towards the north of NH 27 has been proposed to be developed as industrial zone. Industries like warehousing, R&D labs, cold storage among others may be promoted here. Further, areas in the periphery of the existing industries have also been proposed for industrial land-use thereby enhancing the potential for industrial expansion or setting up of industrial parks.

- *Public & Semi-Public Area*

1.01 Sq. km or 6.36% of the total developed area has been earmarked for Public & Semi-Public land use.



**Figure 8-3: Proposed Utilities Map, Tihu Master Plan-2041**

- ***Transportation***

1.6 sq. km or 10.08% of the land has been earmarked for transportation. Efficient functioning of an urban centre depends mainly on its transportation network. Economics, Social & Cultural life of the town is very much determined by the circulation pattern and transportation management.

In preparing the circulation plan of Tihu, emphasis has been laid on the following points.

- Optimum use of existing transportation network through improvement of traffic operations and controls.
- Improvement of existing road network through widening, realignment and extension.
- Improvement of existing road junctions and railway level crossings.
- Provision of adequate parking facilities.
- Development of new road and other transport facilities to provide effective linkages within the town and the region.

- ***Recreational Area***

1.99 sq. km or 12.53% of land has been proposed for recreational land-use. Public parks and immersion ghats will be developed and modernized to elevate public comfort and provide ease of access to them. Riverfront development along the Tihu River is proposed so that citizens can organize cultural, social, and religious events along its course, thereby strengthening community participation and spreading harmony. Recreational facilities with provisions for urban forestry is proposed near industries to act as carbon sink and provide noise and air pollution abatement measures. Development of community ponds is also proposed to add the area's aesthetic appeal.

- ***Agricultural Area***

14.94 sq. km of land has been earmarked for agricultural land use. It has been found that large tracts of agricultural lands are lying fallow. Economic growth is accompanied by shift of these lands from agriculture to other uses. With increase in the value of these lands, they are fast getting converted into residential and commercial land-uses.

- ***Green Belt***

0.18 sq. km of land has been proposed to be developed as green belt. Green belts have been proposed to arrest unrestricted and haphazard development and to provide people with opportunities of recreation. Also with proposals for industries, a green belt is integral for ensuring a good air quality.

## **8.5 PROPOSED LAND-USE AND EXISTING LAND-USE: A COMPARATIVE ANALYSIS**

<b>Sl.No</b>	<b>Land Use</b>	<b>Existing Land _Use</b>		<b>Proposed Land-Use</b>		<b>Difference</b>	
		<b>in sq km</b>	<b>in %</b>	<b>in sq km</b>	<b>in %</b>	<b>in sq km</b>	<b>in %</b>
1	Residential	7.77	24.03	8.28	25.61	0.51	1.58
2	Commercial	0.32	0.99	1.02	3.15	0.7	2.17
3	Public & Semi public	0.32	0.99	1.01	3.12	0.69	2.13

4	Industrial	0.63	1.95	1.32	4.08	0.69	2.13
5	Composite Use	0	0.00	0.66	2.04	0.66	2.04
6	Transportation	0.97	3.00	1.6	4.95	0.63	1.95
7	Recreational	0.51	1.58	1.99	6.16	1.48	4.58
8	Agriculture	20.48	63.35	14.94	46.21	-5.54	-17.14
9	Green Belt Proposed	0	0.00	0.18	0.56	0.18	0.56
10	Water Bodies	1.33	4.11	1.33	4.11	0	0.00
	<b>Total</b>	<b>32.33</b>	<b>100</b>	<b>32.33</b>	<b>100</b>	<b>0</b>	<b>0</b>

## **8.6 DEMARCATON OF PROPOSED AREA UNDER LOCAL AREA PLAN (LAP) AND TOWN PLANNING SCHEME (TPS)**

- **Local Area Plan:** LAP focuses on redevelopment of existing Brownfield areas through revitalization of urban areas by careful examination and planning. It is a micro-planning tool of urban development wherein the existing built-up environment is redeveloped by enhancing various infrastructure such as public space and area under roads. In this Master Plan, 2 areas have been demarcated to be rejuvenated through development at micro level under LAP. (Refer Zoning Map)

LAP 1: Ward No. 6

LAP 2: Ward No. 10

- **Town Planning Scheme:** Under TPS, planning will be done at local level for planned urbanization of Greenfield areas in the future. Land owners will derive immense benefits as they will receive developed plots within organized layout along with urban services like roads, drainage, etc. In this Master Plan, 3 areas have been demarcated to be developed under TPS. (Refer to Zoning Map)

TPS 1: Bamunbari

TPS 2: Ranakuchi

TPS 3: Mathurapur

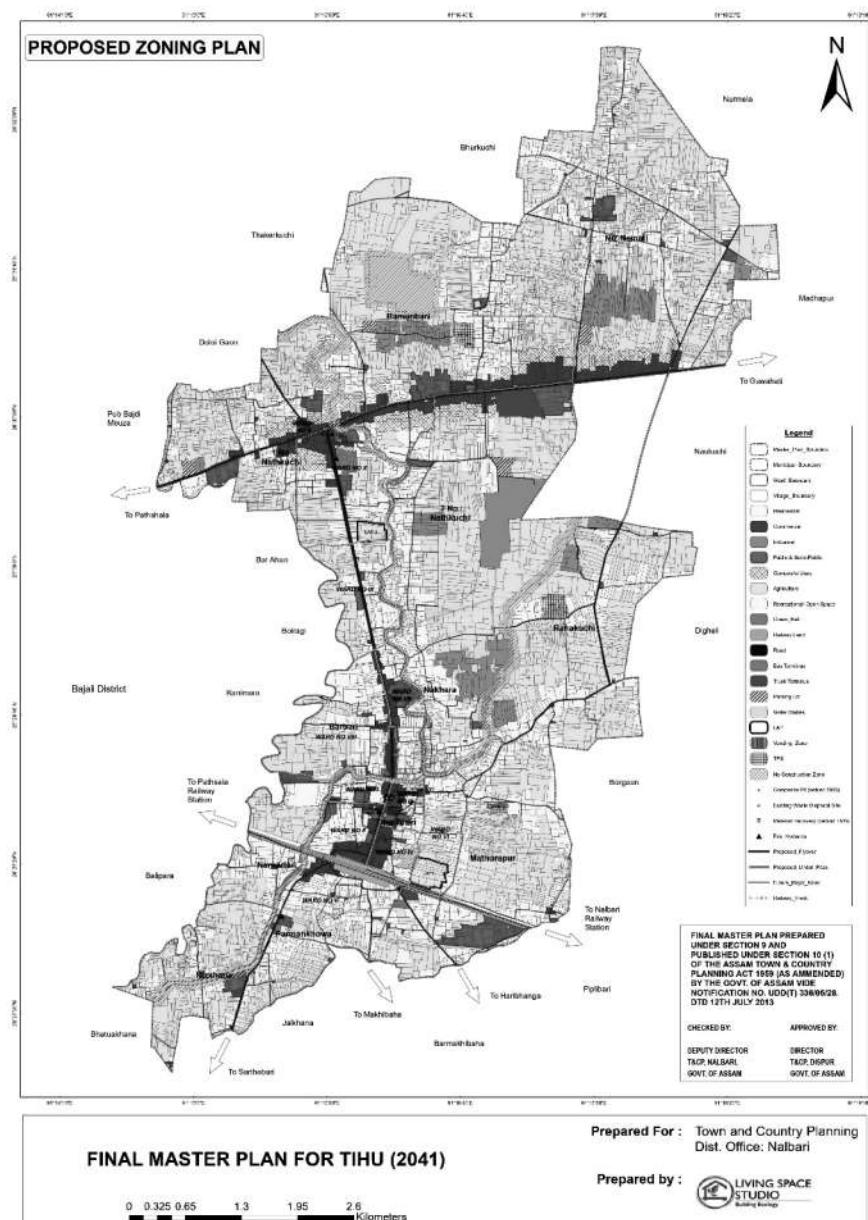


Figure 8-4: Proposed Zoning Map, Tihu Master Plan

## **9. PROPOSED PROJECTS' BRIEF AND TENTATIVE FUNDING SOURCE**

### **9.1 INTRODUCTION**

Tihu town can be converted into a major manufacturing hub and a vibrant commercial centre by reaping the advantages that its location and demography presents. A smart communication and a harmonious interrelationship between different organizations and stakeholders entrusted with the development of the region is to be established so as ensure that growth is sustainable.

For achieving this, future urban planning decisions need to be based on the judicious disposition of activities along with greater planning expediency to align its role for prosperity and planned urban development. The planning decisions of the Tihu Master Plan are consciously aimed at sustained and planned city development. In order to generate positive urban development, the Master Plan would focus on conscious decisions to provide impetus and support to anticipated urbanization.

### **9.2 BASED ON EXISTING CONDITIONS AND PROJECTED REQUIREMENTS OF THE PLANNING AREA, IDENTIFY PRIORITY SECTORS AND PROJECTS**

The Guiding Principles for preparation of Tihu Master Plan 2041 are derived from planning experiences and challenges confronted in the city which include as following:

- Environmentally and Ecological Suitable Development
- Local Economic Development
- Sustainable and Integrated Transport System
- Inclusive and Collaborative Integrated Urban Development
- Mixed-use Development Policy

#### ***9.2.1 Environmental and Ecological Suitable Development***

The topography and drainage system of this region presents a unique challenge towards attaining the perfect balance between resource conservation and utilization. The incorporation of effective environment conservation and sustainability features will be an important aspect in the preparation of this Master Plan. Environment conservation is a major issue that needs to be tackled while planning the development of any area. Efficient measures towards conserving the natural surroundings will be adopted, since the balance between natural and man-made surroundings significantly enhances the quality of life of residents.

Protecting the irrigated and fertile land as well as forest area and development in the less fertile area, will be the aspect of the planning proposal. An appropriate balance between built and un-built areas is proposed to be established so as to provide a good quality of life to the people inhabiting the area.

#### ***9.2.2 Local Economic Development***

The locational advantage of Tihu from commercial, cultural and tourism point of view needs to be viewed as important economic ingredient. To rejig its economy, local economic indicators need to be identified and objectively assessed for taking policy decisions. To improve the economic development in the region, promotion of different economic sectors has to be carried out for diversification and strengthening of

economic base of the city. Job-oriented land-uses have to be propagated in the master plan so that present level of unemployment in the region is drastically brought down. The social infrastructure of the area has to be emphasized as well so that the youths can be skilled, upskilled and reskilled in accordance with the needs of the present times, converting them into sources of demographic dividends.

#### **9.2.3 *Sustainable and Integrated Transport System***

Given the steady industrial and commercial flourishing of Tihu Town, and the constant movement of trucks from the FCI godown and brick kilns, an efficiently functional and sustainable transport system is to be developed, addressing issues like traffic congestions, road safety, and economy.

#### **9.2.4 *Inclusive and Collaborative Integrated Urban Development***

The Tihu Master Plan Area is spread over 11 revenue villages which are predominantly rural in character. The countryside is viewed as a potential area of urbanization for Tihu town in next two to three decades. Being close to the state capital and having good connectivity via road network and railway, the region presents a tremendous scope of growth. Having sound access to raw-materials and skilled and semi-skilled manpower, Tihu can be elevated to a manufacturing hub. The basic planning principle is to create a sustainable blend of rural-urban continuum. The growth is proposed to be inclusive of all income groups integrating sectoral vision for holistic development of the region.

#### **9.2.5 *Mixed-use Development Policy***

##### **9.2.5.1 *Concept***

Any building(s) having a combination of more than one use at a specific point of time is said to have 'mixed use'. For example, a building having one use in the ground floor and other use(s) in the upper floor(s) is said to have mixed use. The mixed use shall not be misconstrued with the mixed use of a plot or a parcel of land. It is a vertical land use change of a building across its floors rather than a change over space laterally. Mixed use is always a combination of main use and the uses which are incidental to the main use. While the main use is defined as the Primary use, the incidental use is construed as Secondary use. It is an important planning tool to accommodate the unforeseen land use changes resulting because of competitive market forces in city centres and along important streets. Mixed use has also become inevitable because of limited scope for horizontal expansion as well as scarcity of land in such areas. For example, commercialisation along main arterials within the residential areas is an illustration of land use conversion resulting because of such factors. The main requisite underlined for the mixed use model is the compatibility of the uses in terms of their type and intensity. In no case, the uses defined as obnoxious or hazardous in this master plan under land use regulations shall be permitted under mixed use category. The secondary use has to be essentially subsidiary or conforming in nature like convenient shopping, primary health and education facilities and basic public services and amenities having manageable impact on the surrounding land use. However, this trend has to be regulated and restricted as prescribed in this Master Plan for numerous benefits and as such, has been for purposes of this Master Plan defined objectively to avoid its misuse while issuing building permissions. For purposes of this Master Plan, mixed use is defined where:

In case of mixed use distribution, the secondary use shall be restricted to one floor only (preferably the ground floor) which is more susceptible to land use changes. While issuing the mixed use permits, care should be taken to consider the Secondary use as ancillary use to the main use in size and scale within the structure.

##### **9.2.5.2 *Composite Mixed Landuse Model***

As a policy measure, the proposed land use is viewed as a Composite Use broadly segregated and integrated across sectoral uses. As an inherent flexibility in the Proposed Land-use Plan, it is proposed to calibrate and

to integrate the proposed land use to the hierarchy of road network in a horizontal mix, however, essentially segregating the hazardous and obnoxious uses. The policy is applicable to those uses which have been made permissible in a particular landuse.

In this Master Plan, a Composite Mixed Landuse Model is envisaged along the designated roads based on their proposed RoW.

### **9.3 FUND REQUIREMENT FOR EACH SECTOR/PROJECT IDENTIFIED UNDER THE SECTORS**

No fiscal plan has been worked out at this stage. The final Master Plan would provide a basis for preparation of five yearly development programmes and yearly fiscal plans for implementation. For each project, fund requirement will be finalized by the ULB and concerned line departments as per Government instructions.

### **9.4 IDENTIFY LAND SITE FOR PROPOSALS: IN CASE OF GOVERNMENT LAND, INVENTORY OF MUNICIPAL LAND, STATE GOVT./ GOVT. AGENCY OWNED LAND, ETC. AND PLAN FOR ACQUIRING/LEASING THE SAME**

The Master Plan proposes Negotiated Land Acquisition in place of compulsory land acquisition as an innovation in land acquisition procedures for speedy urban development in consultation with various Govt. Depts.

**Concept of land pooling:** As per the survey conducted by Town and Country Planning, Nalbari, it was observed that few areas in the villages included in the MP are not deficient of housing but are cases of non-development, which is primarily due to lack of awareness and education. The people are staying in houses made of locally available materials. The source of livelihood for these families is agriculture and menial informal sector works. The main need of the hour is to impart awareness among these masses that where they are residing is not sustainable and that it poses a threat to their lives. There is an urgent need to upgrade these houses. They have the tenure ship but their economic status make it hard for them to upgrade.

### **9.5 INDICATIVE SOURCES OF FUND: SPECIFIC CENTRAL SCHEME FUNDS (10%, NLCP, AMRUT, INFRASTRUCTURE DEV FUND, ETC) ASSAM FINANCE COMMISSION FUNDS, CM'S SPECIAL PACKAGE, PUBLIC PRIVATE PARTICIPATION, LOAN FROM (EXTERNALLY AIDED PROJECT (JICA-WORLD BANK-ADB), ETC.**

#### **ROADS:**

- **National Highways:** The Government of India passed the National Highway Act, 1956, to take the responsibility of building and maintaining the National Highways.
- **State Roads:** These roads are constructed and maintained by the Public Works Department (Roads).
  - I. "Assam Road Maintenance Policy" and "Assam Road Maintenance Fund Rules" came into force with effect from 25 September, 2014. Its main objectives are to make

- available funds to Assam State Road Board (ASRB) on a sustainable and dependable basis for maintenance of State Roads.
2. "Assam State Roads Project" is an Externally Aided Project (EAP) implemented for by the Public Works Roads Department (PWRD) through the ASRB for improvement of State Highways (SH) and Major District Roads (MDR) in the State.
  3. The Central Road Fund (CRF) was established by the Parliament by law (Central Road Fund Act 2000) in order to fund the development of State highways, Major District Roads, etc. The Fund is utilised for projects relating to the construction and development of State Roads including roads of inter-State connectivity and of economic importance.
- **Village Roads:** Village roads are maintained by the Zilla Parishads and PWD. Pradhan Mantri Gram Sadak Yojana is a notable scheme launched by the Government of India to provide good all-weather road connectivity to all villages in India. In 2015, it was announced that the Central Government would contribute 60% of the funds and the State Government would contribute 40% of the funds.

***City Beautification:***

City beautification projects like public parks, river front developments, multi-utility buildings may be taken into consideration by the ULB and the concerned line departments. PPP models should be explored to make the projects more sustainable.

Availability of adequate funds is an important determinant for successful implementation of the plan proposals. While conventional pattern of project financing is being in transition, the private investments and public private partnership modes of infrastructure development assumes greater significance. This apart, the programmes of the National Government provides greater opportunities for improving the status of infrastructure and service delivery. Hence, it is the responsibility of every development agency concerned to take initiatives to draw maximum funding for the plan implementation.

## **10. DISASTER PLAN**

### **10.1 INTRODUCTION**

The District Disaster Management Plan is an effective plan which envisages several measures that can be taken in the event of any kind of disaster. The State Policy recognizes that hazards are inevitable but these need not convert into disasters. This Policy is based on the twin principles of minimizing human suffering during disasters and reduction of financial losses through integration of disaster risk reduction activities into development planning.

Owing to a unique geographical and geo-climatic setting, the State of Assam has witnessed a number of disasters, ranging from incidents of fires to destructive floods and catastrophic earthquakes. The State has witnessed many natural and manmade disasters especially in the 19th and early 20th century. In the wake of recurring disasters, the State has always paid heavily in terms of loss of life and property. Like other parts of the State, Tihu Town is a multi-hazard prone area. Multi Hazards which are confronted in the town are detailed in table below-

**Table 10-1 Multi Hazards Areas Covered**

<b>Sl.No</b>	<b>Hazard</b>	<b>Areas Covered</b>
I.	Floods	Nalbari is one of the flood prone districts of Assam. The Tihu river flows through the heart of the Tihu Master Plan Area which overflows during the monsoon. Flood occurs generally in the low lying areas of the district during May to August.
II.	Earthquakes	The tectonics of the Assam region is dominated by convergence of the India, Burma and Eurasian plates and is categorized as Seismic Zone- V which would need special measures to mitigate, minimize and safeguard the life, property and infrastructure which makes structural safety important.
III.	Erosion	Areas along major Riverbank
IV.	Drought	Most of the paddy growing areas depend upon the rainfall. The monsoon commences around the middle of April/May. For timely agricultural operation, a few showers of pre-monsoon rain is absolutely necessary. Regular rainfall till the middle of October can ensure a good harvest. But, if the rainfall at any circumstances will not happen then this will lead to improper agricultural operation and growth of crop and finally the drought will occur. So drought is caused due to failure of rains in season. The areas under drought need recharging and retention of water table for both urban and agrarian activities.
V.	Wind storm	Occasional wind storms is destroying crops, horticulture and houses in Tihu & it is prone to high speed winds causing extensive damages to urban infrastructure and urban forestry.
VI.	Hailstorms	Although hailstorms rarely involve loss of lives, their economic impact can be severe. The damage appears to be a function of the intensity and duration of storms and the size of the hailstones, which these produce. The damage itself is often produced not only by the impact of falling hailstones, but also by the high winds and torrential rains that is part of the hailstorm.

VII.	Fires	In Assam due to peculiar housing patterns maximum fire accident cases takes place. These houses are of generally mud-built walls with thatched roofs made out of timber, bamboo and straw. They spring up in clusters. In summer fire accident becomes frequent; it destroys houses and properties and causes serious distress to the afflicted people. In Assam, the Harijans, Adibasis and other economically backward group who live in congested localities are the targeted victims of the Fire Accident. However, incidents of fires are recorded in the congested parts of the city and urban poor areas.
VIII.	Human induced disasters	All parts of the Tihu Town vulnerable to man-made disasters due to competing urban uses, high cost of land and limited land resource.

District Disaster Management Authority should get area-specific hazard, vulnerability and risk maps prepared using GIS database for mitigation and emergency management. The plans so developed shall be operational, regularly reviewed and updated. This will help in the vulnerability assessment of town after proper zonation. Specific measures like micro-zonation of Tihu Master Plan based on disasters and integrating it with the land use planning and zoning regulations, retrofitting of infrastructure and buildings, disaster-safe construction technology and strengthening the capacities of communities shall be promoted in a time-bound manner. The construction work and other activities that may lead to situations eventually resulting in disasters shall be monitored regularly in vulnerable areas like water-bodies, hill slopes.

Hazards like earthquakes and cyclones do not kill people but inadequately designed and badly constructed buildings do. Ensuring safe construction of new buildings and retrofitting of selected lifeline buildings is a critical step to be taken towards earthquake mitigation. The Building construction, material and design specifications as laid down in the National Building Code-2005 shall have to be a mandatory requirement for important and high rise buildings. In case of areas having moderate to high vulnerability of flash floods and landslides, the buffer zones envisaged in this Master Plan need to be implemented while permitting any development in such areas.

## 10.2 SAFETY AGAINST NATURAL DISASTERS

### 10.2.1 *Earthquakes*

The application for seeking building permit shall be accompanied with a report of Architect/Structural Engineer certifying that the proposed structure has been designed structurally keeping in view the safety measures against earthquakes as indicated in the following Bureau of Indian Standards (B.I.S).

#### Bureau of Indian Standards (B.I.S).

- a. IS: 13935: 1993  
Repair and Seismic Strengthening of building guidelines
- b. IS: 1893 (part i): 2002  
Criteria for Earth quake Resistant Design of structure
- c. IS: 4326 1993 (2002-04)  
Earthquake Resistant Design and Construction of building – Code of practice

- d. IS: 13920: 1993  
Ductile Detailing of Reinforced Concrete structures subjected to seismic Forces – Codes of Practice
- e. IS: 13827: 1993  
Improving Earthquake Resistant of Earthen Building – Guidelines
- f. IS: 13828: 1993  
Improving Earthquake Resistance of low strength Masonry Building Guidelines

#### **10.2.2 *Fire Protection and Fire Requirements***

This part covers the requirements of the fire protection for the multi-storied buildings (high rise buildings) and the buildings which are of 15 mtr. and above in height and low occupancies of categories such as Assembly, Institutional, and Educational more than two storeyed and built-up area exceeds 1000 sq.mt. Business where plot area exceeds 500 sq. mt., Mercantile where aggregate covered area needs 750 sq.mt., Hotel, Hospital, Nursing Homes, Underground complexes, Industrial storage, Meeting/Banquet halls Hazards Occupancies.

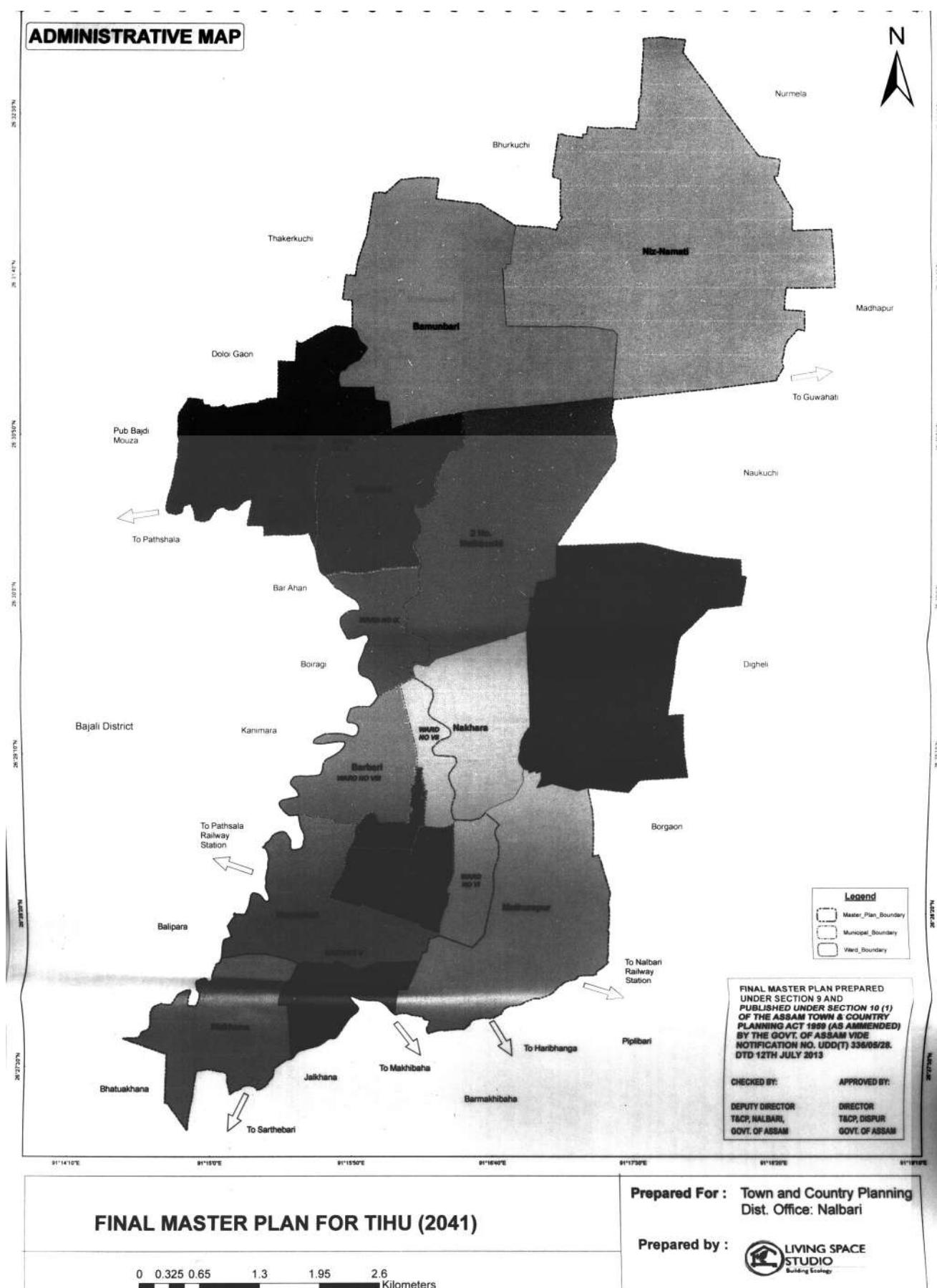
**Fire protection requirements:** Buildings shall be planned, designed and constructed to ensure fire safety and this shall be done in accordance with Part IV Fire protection of National Building Code of India. The building schemes as such also be cleared by the District Officer of the Fire and Emergency Services Department before issuance of building permit.

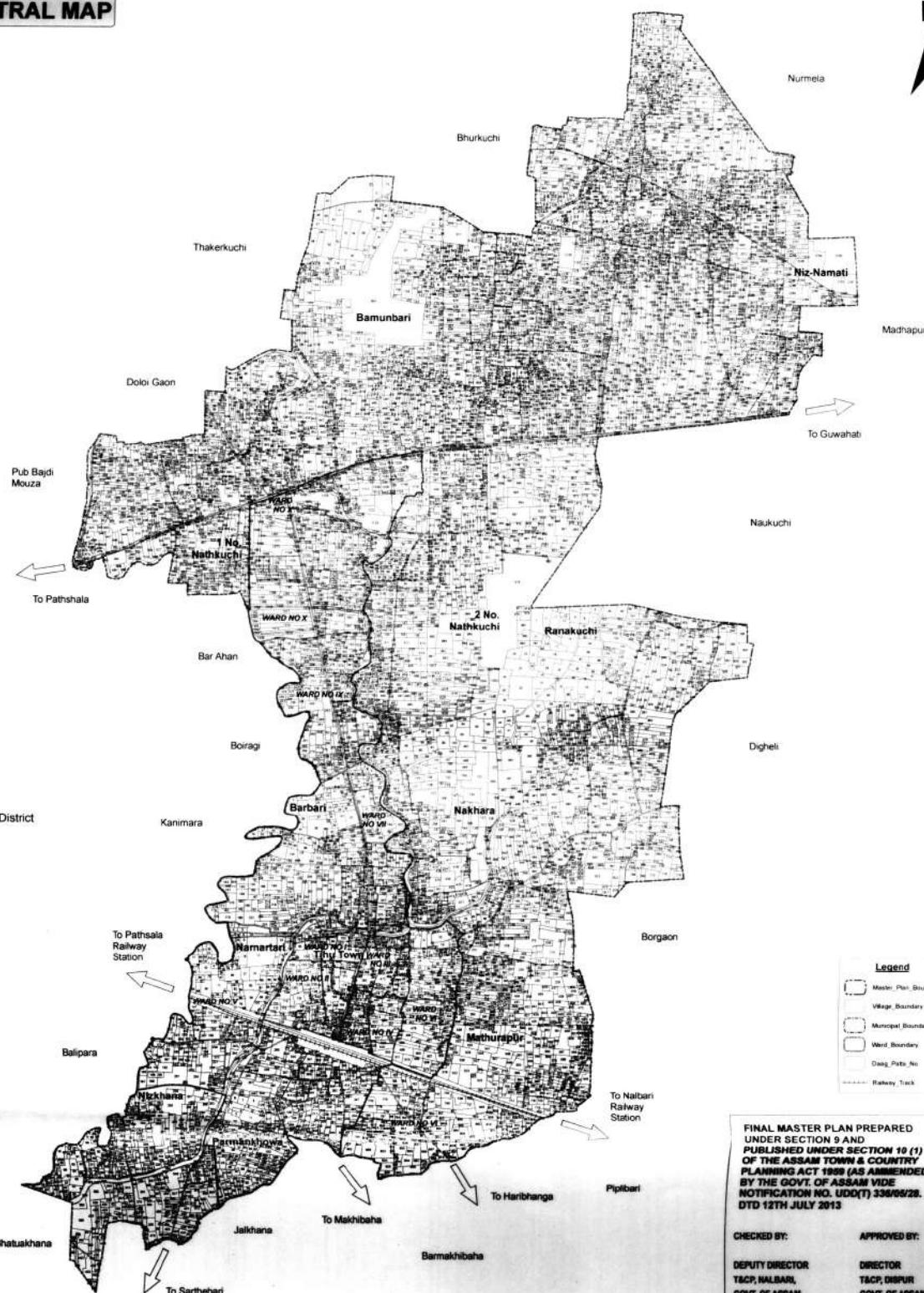
#### **10.3 STANDARD OPERATIONAL PROCEDURE (SOP) ON DISASTER: PRE-DISASTER, DURING AND POST DISASTER**

The District Disaster Management Plan-2014 (DDMP) updated by District Disaster Management Authority is an effective plan which envisages several measures that can be taken in the event of any kind of disaster within its territorial limits.

The plan deals with Risk Assessment and Vulnerability Analysis, Identification of disaster prone areas, Response structures, Inventory of Resources, Standard Operating Procedures, Directory of Institutions and key Individuals. The plan is prepared to help the District Administration focus quickly on the essentials and crucial aspects of both preparedness and response.

The Master Plan proposes that the facilities like hospitals, fire services, police, schools, water supply, bridges, flyovers and underpasses, electricity, grid stations are critical in nature for post -disaster management. To ensure functioning of critical facilities, buildings occupying such facilities and falling in Seismic Zone- V shall be retrofitted. District Disaster Management Authority- Nalbari, shall develop a clear cut retrofitting strategy at its own level for this purpose. Safety audit of all existing important public and assembly buildings shall be done within one year.



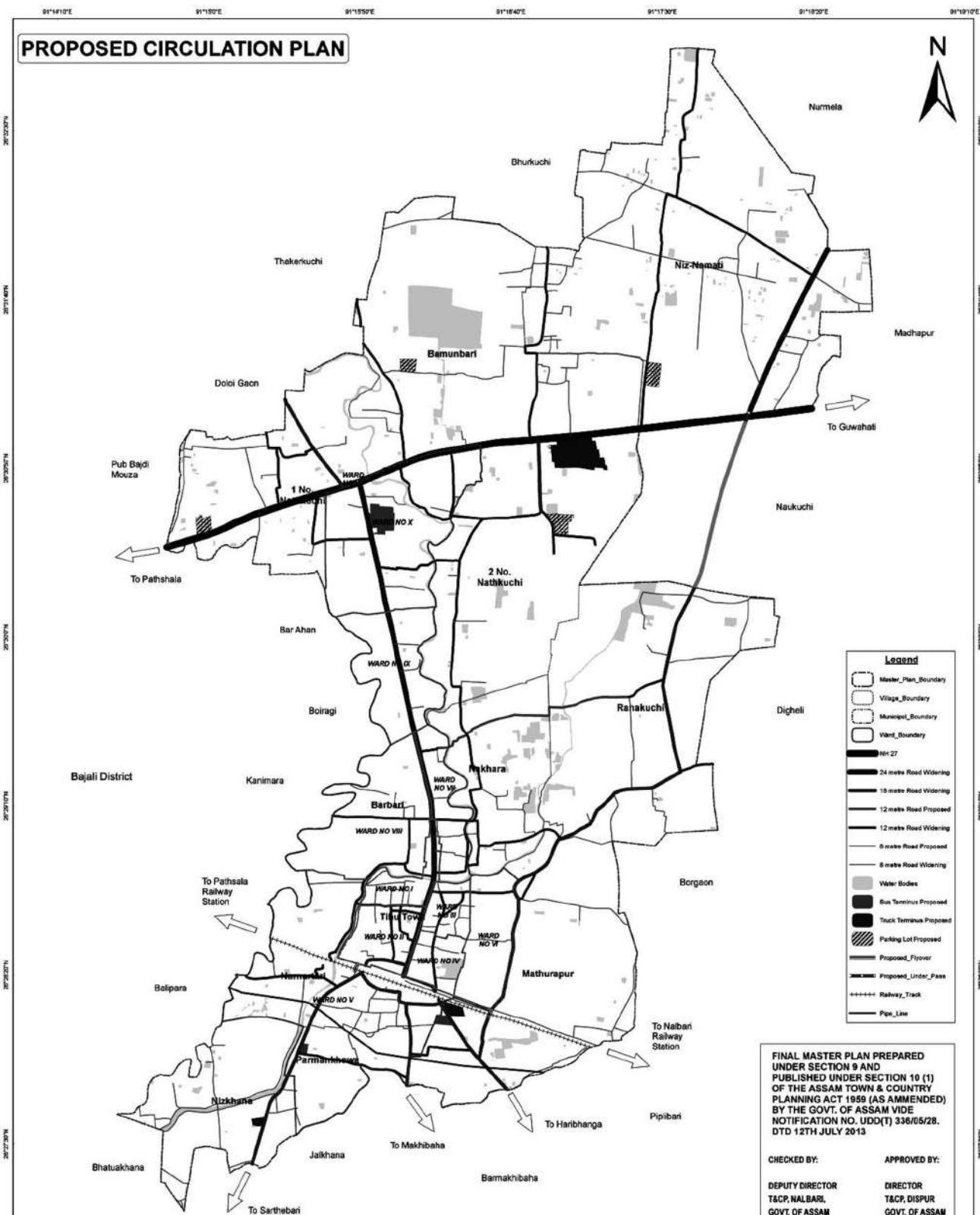
**CADASTRAL MAP****FINAL MASTER PLAN FOR TIHU (2041)**

0 0.325 0.65 1.3 1.95 2.6 Kilometers

Prepared For : Town and Country Planning  
Dist. Office: Nalbari

Prepared by :



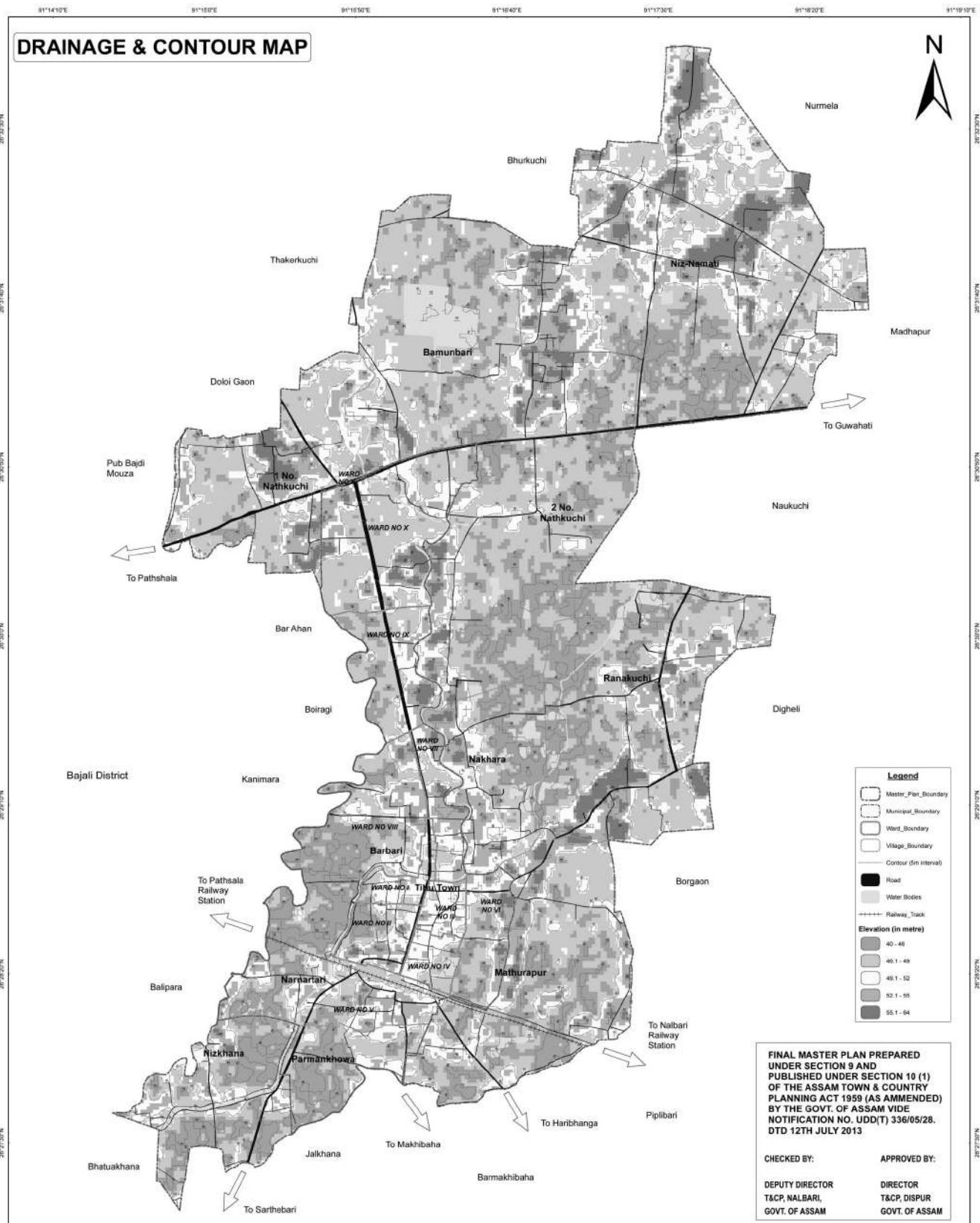


FINAL MASTER PLAN FOR TIHU (2041)

**Prepared For : Town and Country Planning  
Dist. Office: Nalbari**

Prepared by :

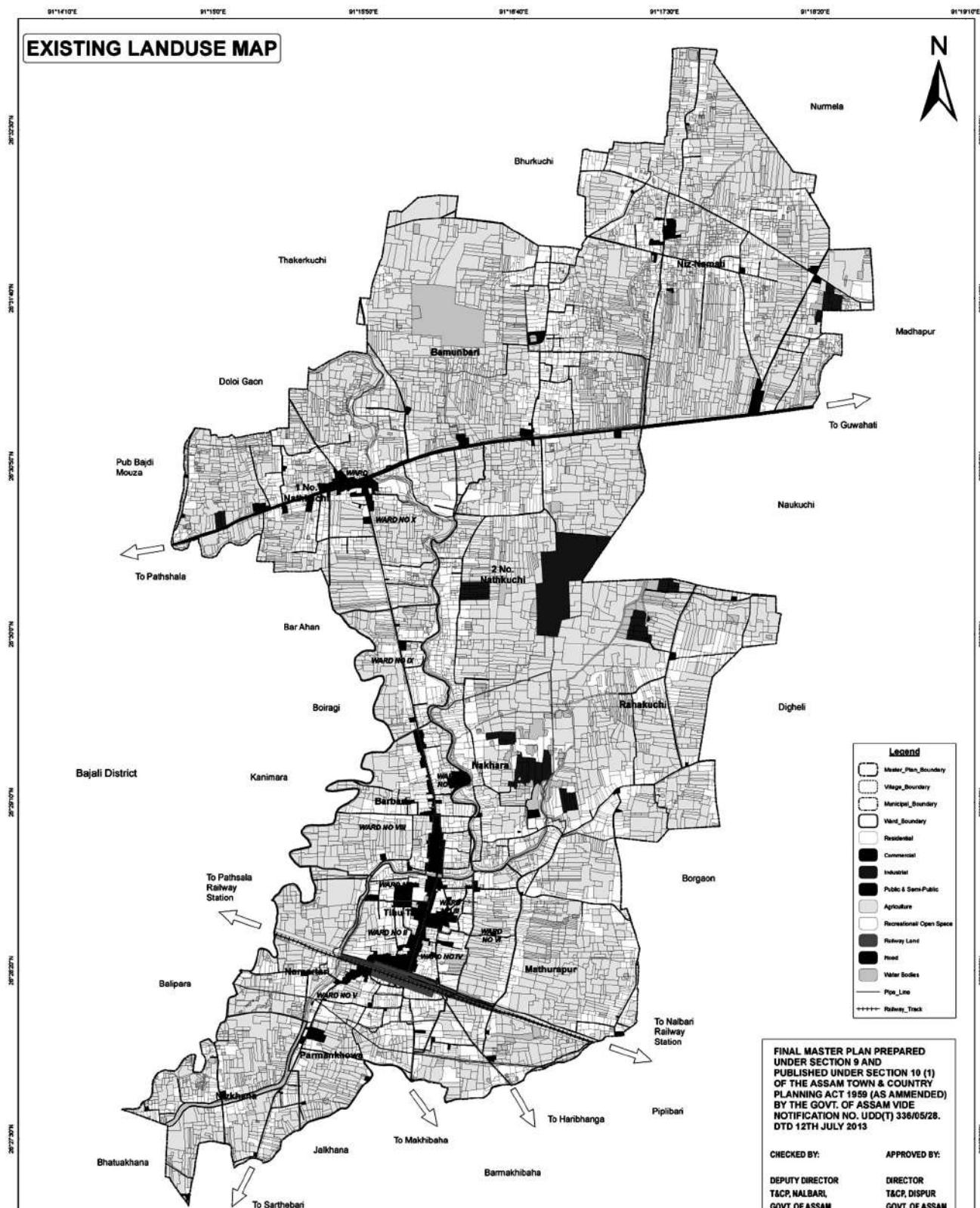


**FINAL MASTER PLAN FOR TIHU (2041)**

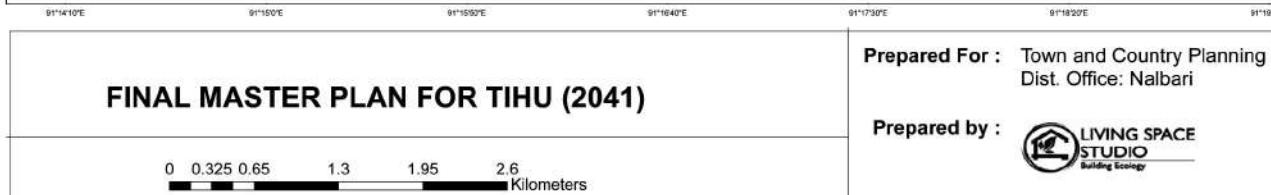
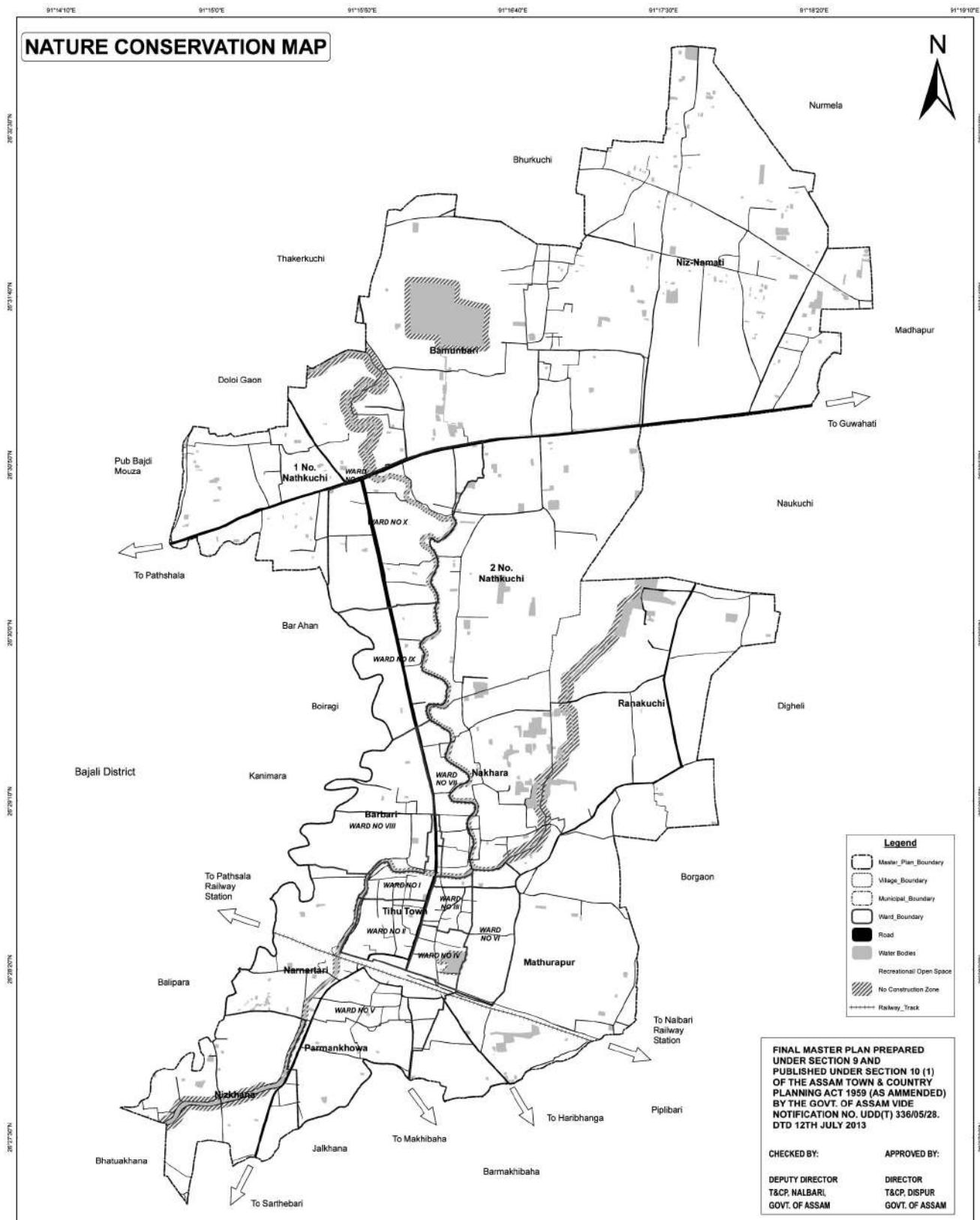
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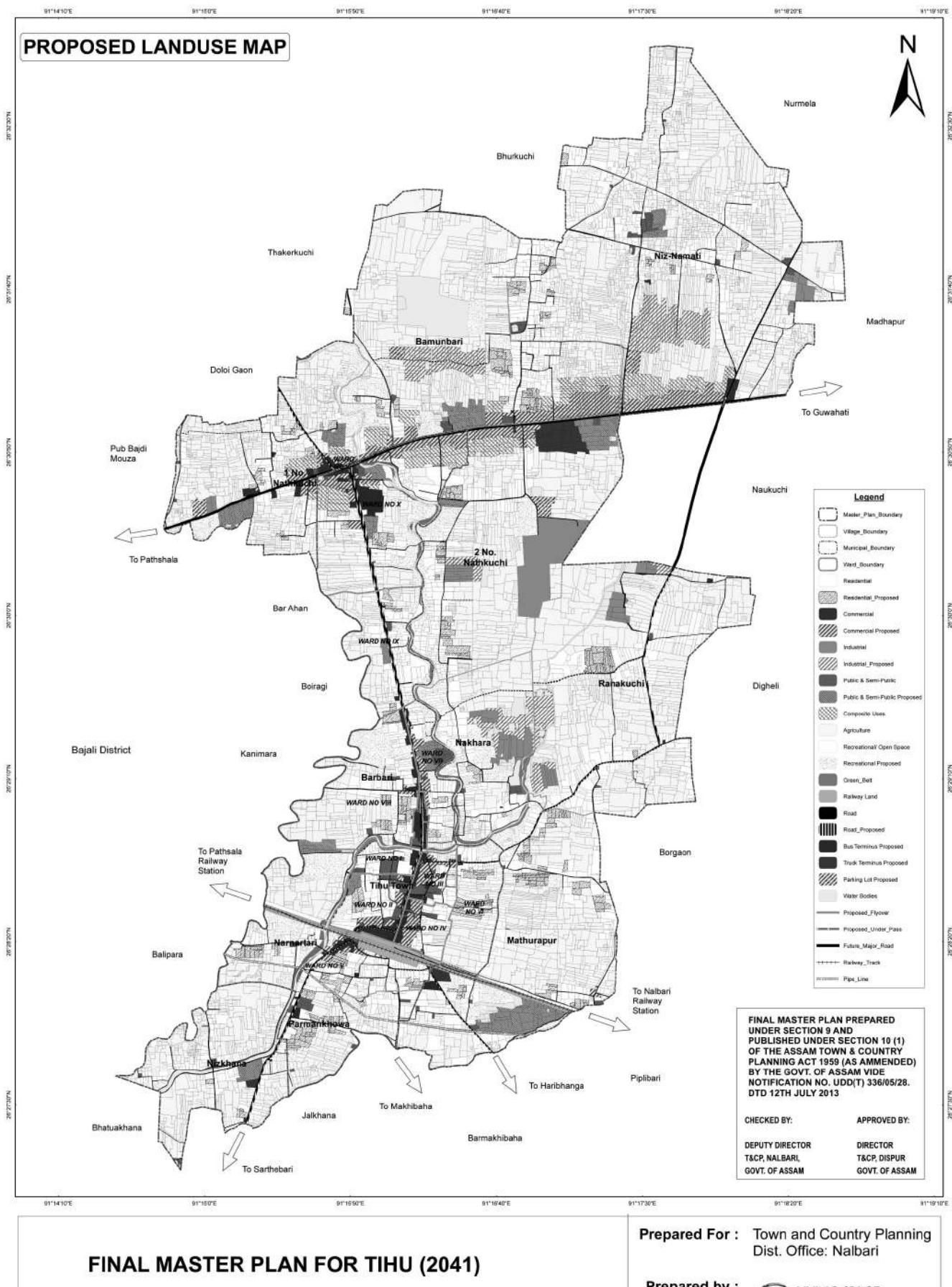
**Prepared For :** Town and Country Planning  
Dist. Office: Nalbari

**Prepared by :**  LIVING SPACE STUDIO  
Building Ecology



<b>FINAL MASTER PLAN FOR TIHU (2041)</b>	<b>Prepared For :</b> Town and Country Planning <b>Dist. Office:</b> Nalbari
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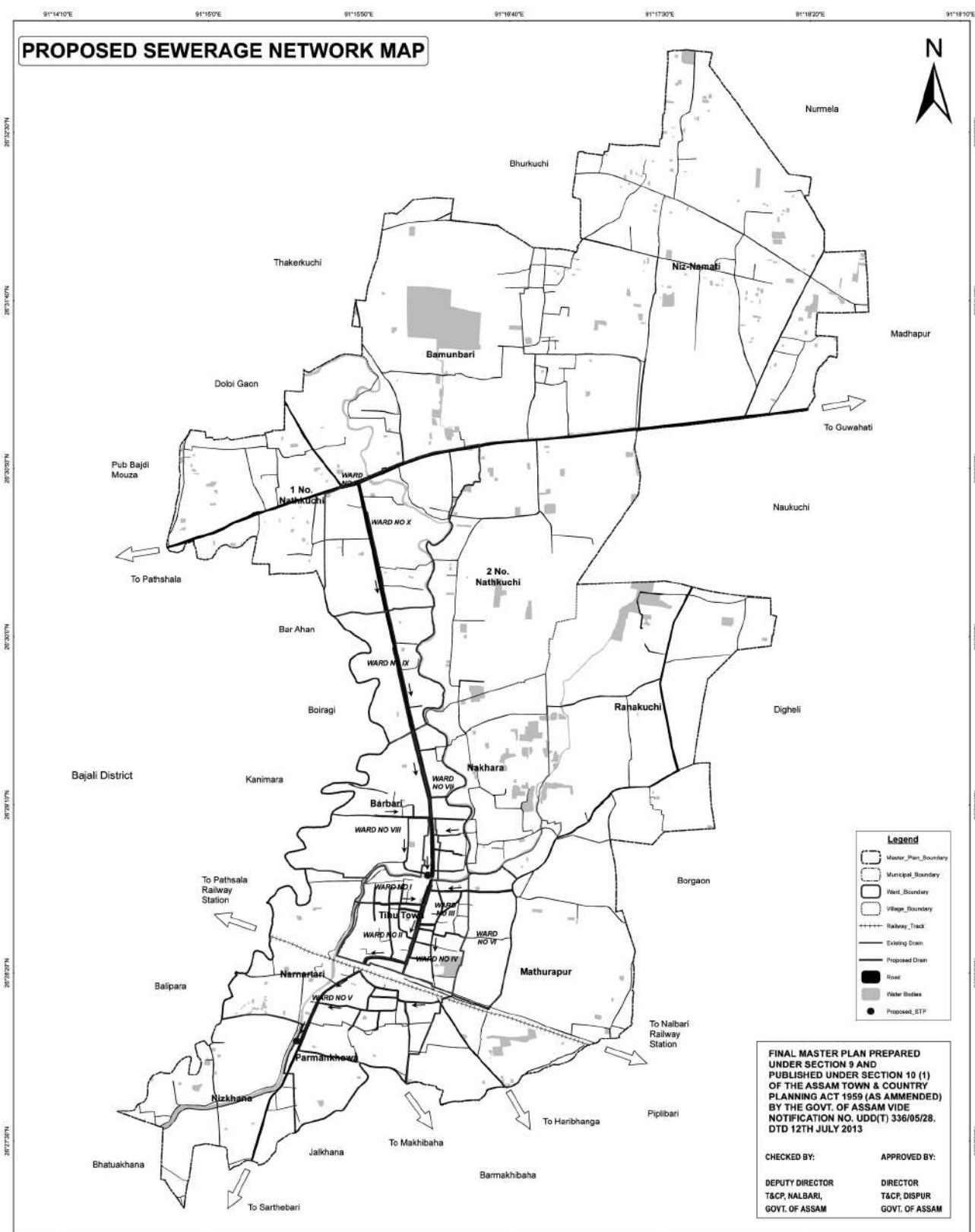
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Dist. Office: Nalbari

Prepared by :



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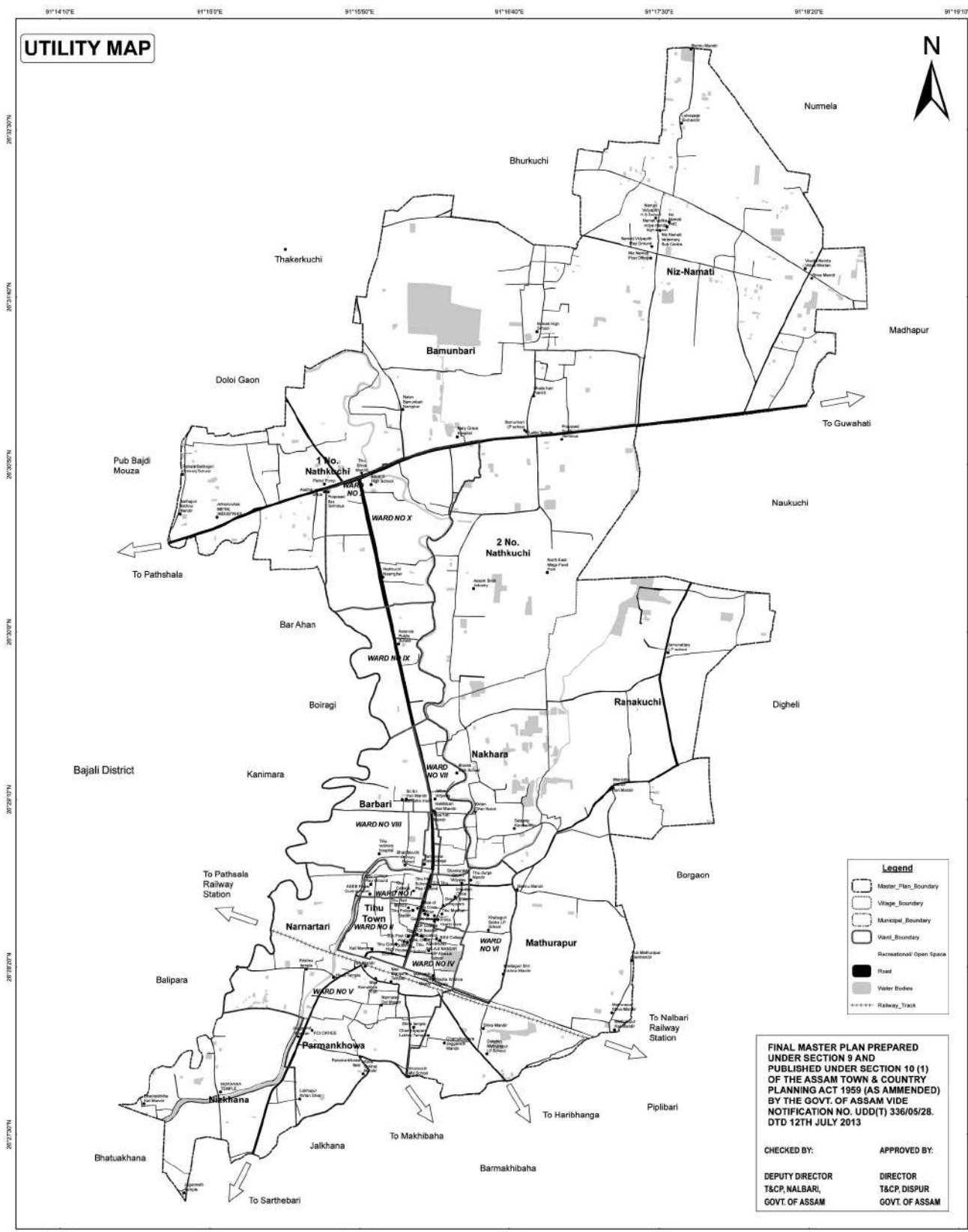
### FINAL MASTER PLAN FOR TIHU (2041)

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Prepared For : Town and Country Planning  
Dist. Office: Nalbari

Prepared by :





FINAL MASTER PLAN FOR TIHU (2041)

**Prepared For :** Town and Country Planning  
**Dist. Office:** Nalbari

Prepared by :



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